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ENGLISH AND AMERICAN WIRING RULES AND REGULATIONS.

IN a recent issue of the *Electrical Review and Western Electrician*, namely, the issue bearing the date December 5th, 1914, a detailed comparison was made between the "National Electrical Code," which is in use in the United States and Canada, and the German and English rules. The comparison, which is set out in three parallel columns, occupies 10 pages of the journal referred to, although it deals solely with the wiring rules concerned with inside work, which form considerably less than half of the complete code; the latter covers also the wiring of central stations, transformer sub-stations, outside work, marine and miscellaneous work, in addition to comprising a large section devoted to constructional details of fittings, cables, switches, and other wiring accessories.

In our Institution Rules the standards adopted for cables, conduits, &c., are those defined by the Engineering Standards Committee (E.S.C.). The rules make reference to these but do not quote them *in extenso*. It is very doubtful if the average contractor has ever troubled to read them or even to obtain a copy, and the average wireman has probably never heard of them, nor do they greatly concern him. The contractor knows that there is a difference between "Association" and "non-Association" cable, but he knows more about the difference in the price than in the cable, and he must accept the maker's guarantee as an article of faith. As to applying any tests to prove that he is getting what he pays for, we doubt if anything beyond gauging the wire is done, and it would be beyond the practical capabilities of many to measure the resistance of a coil with sufficient accuracy to say whether or not it came within the permissive margin of 2 per cent. variation from the standard. We do not say this in disparagement of the wiring contractor; he does not regard it as his business, nor has he generally the necessary measuring appliances.

Seeing that he is entirely at the mercy of the manufacturer, there is something to be said in favour of the system of testing and issuing certificates of approval which has been adopted by the National Board of Fire Underwriters in the States. We assume that so long as a contractor working under the National Code employs "approved" materials, he accepts no responsibility in connection with them, but this point is not clear.

The National Electrical Code is revised every two years, and the time for revision is now approaching; it is possibly due to this fact that so much attention is at present being devoted to the discussion of wiring matters in the American technical Press. There appears to be a feeling that electric wiring is passing, or about to pass, through a transition period in which the piping or conduit system may have to give place to some of the later systems which have been devised, just as casing has been gradually, but none the less surely, replaced by conduit. There is in this country at the present time a tendency to ask if all the advantages supposed to be possessed by conduit wiring are real or mythical, and many contractors, some consulting engineers, and, we believe, also insurance companies, are disposed to look more favourably upon wood casing installations now that jointing has been largely superseded by looping of connection fittings. Eliminate joints from the conductors actually enclosed by the casing, and there is very little left in the system which can be objected to from the

point of view of fire risk when it is used for ordinary residential buildings, and in dry situations. It will be generally agreed by those competent to express an opinion, that a good casing installation is better than a poor conduit job.

The chief objections to the wood casing system were the risk of fire due to bad jointing or connections within the casing, and the unsuitability of casing for sinking flush or burying in plaster when surface work was undesirable.

It is not without interest to note that the special wiring systems which have from time to time been brought out, such as the Stannos system, Henley's wiring system, and cab tire sheathing, owe their inception to cable makers rather than to electrical contractors, as was the case with wood casing and conduit. We do not think that it is claimed by the originators that any one of these systems is capable of universal application, although no doubt each has merits when confined to specialised or particular classes of work.

Conduit wiring is the prevailing practice in the States, and, judging from the tone of the technical Press, we gather that there is a fear among the makers of conduit that the National Code may be revised so as to admit newer methods in which conduit is not used.

The essential difference between our own Institution Rules and those of the National Electrical Code is that ours are of a more general character, specifying the conditions which are to be complied with rather than the actual methods to be adopted and the specific details of fittings and materials to be employed. This is what the National Code purports to do, and is, no doubt, one of the chief reasons which necessitate its frequent revision.

The National Electrical Code is the official code recommended by the National Fire Protection Association, and is drawn up chiefly by men interested in electrical work from the fire insurance point of view. Our rules, on the other hand, are drawn up by a Committee of the Institution of Electrical Engineers representing the various sections of the electrical industry, and including also representatives from the insurance companies. This may account in some measure for the greater stringency of the National Code on some points. We do not think that we should serve any useful purpose to English readers by tabulating in parallel columns the National Code and our Institution Rules, because in many respects, where they cover the same ground, the differences are only verbal. There are, however, notable differences here and there due in part to the different character of the constructional work obtaining in the two countries, but the chief characteristic which distinguishes the Code from our Rules is, as mentioned above, the section in the Code devoted to details of manufacture. Now that our own manufacturers are more fully alive to the export business which may be done, perhaps not with the States, but with the Dominion of Canada, we think it is important that they should appreciate that any fittings designed for use in that Colony will not only have to be in accordance with the National Code Rules, but will have to be officially tested and approved by the laboratories of the National Board of Fire Underwriters.

We understand that the B.E.A.M.A. has the matter under consideration, and that attempts are being made to induce the Revising Committee to modify certain of the regulations in order to bring recognised and approved British fittings within the requirements. There is no doubt a feeling in the States that some of the conditions are unnecessarily stringent, and that they tend to retard the rate of electrical progress. If, therefore, without sacrificing anything which tend to safety and immunity from fire risk, the Revising Committee is of opinion that some of the restrictions may be relaxed somewhat, it is quite probable that some modifications will be made. But such modifications, if any, will be made solely in the interests of electrical work in America, and not for the purpose of making it easier for British manufacturers to compete with American productions in the American and Canadian markets. Too much, therefore, must not be expected from the forthcoming revision, but our manufacturers must rely rather on modifying their designs where necessary so as to comply with the Code. Whilst we do not propose here to enter into a detailed comparison of the American and English rules, we would refer our readers to a critical commentary which is concluded in this issue by Mr. Frank Broadbent, whose paper on wiring rules, read before the Newcastle Section of the Institution in February, 1901, was among the first which showed in tabular form the extraordinary differences then existing between the rules of the Institution and those of various supply authorities and insurance companies in this country. Happily since that date the revised Institution Rules have been adopted as the National Standard, to the advantage of all concerned, and if subsequent revisions on both sides should bring about a greater degree of uniformity between the American and British National Codes, the advantages would, no doubt, be mutual.

NATIONAL TRADE POLICY.

British manufacturers have been so often accused of indifference in connection with export trade development, that we fear that much of the criticism and advice that are vouchsafed through the columns of trade journals, or by the medium of special trade reports, receives but scant attention. It is a thousand pities if that is true, for many of those who take the trouble to express their views have the best interests of British industry at heart, have first-hand and authoritative information upon which they base their criticism, and find no satisfaction in mere depreciation of the doings or misdoings of their own race. There can be no question about our having done ourselves a good deal of injury in past years by wasting so much time in discussing the opinions of people who have seemed to be in the seventh heaven of delight when they have been advancing "proofs" of our decadence as a nation. Physically, scientifically, industrially, and spiritually—according to the particular exponent of the phase and of the time—have we been on the down grade. Somebody was soon to write the "Decline and Fall of the British Empire"! Unfortunately, discussions of this kind cannot proceed within our borders without outside observers, who do not understand the British character, accepting us at our own apparent valuation.

It hardly lies within our province to dwell upon the view held by some students of these days that from the standpoint of national character this terrible war, notwithstanding all its awful loss in blood and treasure, is not only going to stay or prevent any tendency in the direction of decadence which affluence and internal differences might have induced, but is going to re-establish the prestige of the British nation in respect of the high standards for which it has so long stood. All the old qualities of our fathers have reasserted themselves. Who talks of physical degeneration, of spiritual apathy, after five months of war? Bernhardi-Shaws, "Gloomy Deans" and some evening newspapers are not to be seriously regarded.

Yet we shall not be well advised if we allow to pass unheeded those who ask us not to imagine that all is well with our methods when we consider our relation to the world-trade problems.

Communications continue to reach us from all parts of the Empire, to which we are compelled to afford publicity if we are to fulfil faithfully what we regard as our duty as Editors. It is, and always has been, distasteful to refer to British shortcomings in respect of our export trade, but the views recently expressed by some of our correspondents in India and Canada are typical of many such criticisms that reach us, and they should not be ignored; more are before us as we write.

An Indian critic accuses us of "utter slackness"; a Canadian correspondent says that Britain loses trade in Canada "through lack of attention"; an Australian writer gives us statistics showing the attention that Americans have been paying to the Commonwealth, as evidenced by his own correspondence received since the outbreak of war; others hold up for our reproof the courtesy and eagerness of Continental firms. All of these criticisms are so much like what we have heard for many years past, that we are not justified in suspecting them of

relating to isolated and exceptional cases, though we recognise that there may be another side to every complaint. If we mention them now it is less with a desire to decry the methods of the British manufacturer—there is no useful purpose to be served by that alone—than to suggest that when we are contemplating more aggressive efforts to meet the electrical and engineering requirements of other countries, we should remember the frame of mind of some of our potential customers and the virtues credited to our competitors.

We have already dwelt at some length upon the need for co-operative action on the part of manufacturers, though we have not yet witnessed any very strong movement in that direction. Probably the lack of it is due to the pre-occupation of our firms with direct or indirect Government orders, to the handicap due to absences on active service, and to the indisposition to make definite movements while our national life continues under a cloud owing to the enforced slowness of military operations in winter. But we must continue in these days to prepare for what is to follow when conditions change, as they must do before long—perhaps sooner than we think. While we are trying to possess our souls in patience concerning the forward movement in France and Belgium, forces and equipment are being prepared which will make victory sure. There is the same call for patience in regard to the Trade War, for the opportunities for actual advance are not facilitated by the financial and shipping difficulties that now prevail; but there is as great need for preparing ourselves as business men, as there is for training and arming Kitchener's Army. There is a strong desire in the Colonies that such an invulnerable line shall be drawn by our trading forces that Germany shall not again be able to break through into markets which by right are ours. How are we going to make that line invulnerable? If there have been weak places, owing to faulty methods in the past, we ought to sit down seriously, not showing ill-will at the strictures of our critics, and weigh up the whole matter and adopt measures to prevent the existence of vulnerable points in the future. We refer now, of course, to that kind of reform that lies within our power as manufacturers or traders—an improvement of our own trading efficiency.

We, of course, recognise that there are other matters of prime importance that lie beyond the power of the individual trader. There is a very strong conviction in some quarters that something in the nature of working co-operation, concentration, or even amalgamation of interests, is required in order to enable British firms to deal with the industrial position effectively, so as to prevent unscrupulous aggression on the part of Germany's consolidated electrical and financial forces both in the Home and Colonial markets in the future. That is a matter essentially for manufacturers who know the difficulties with which they have had to contend, but those who study the position as onlookers cannot forget the advice that has been vouchsafed by experienced minds, nor can they shut their eyes to the results that followed the "bulk" manufacturing operations of Germany and the United States. Without such concentration, there must continue a vast amount of wasted effort and expense always adversely affecting the cost of production. The spectacle of half-a-dozen comparatively small British firms competing against each other in a British colony for a contract, while a powerful German or American organisation carries off the prize, is humiliating to all save the winner. If concentration of interests is not acceptable, let us at least have something in the form of organised British co-operation, and secure the spoils for division among British works.

We fear, however, that some of the most representative spirits in the electrical industry are disinclined to plunge into new ventures or to assume added liabilities and responsibilities because of the failure of the Government to listen to the appeal that has been made to it to formulate some policy in regard to the future fostering of British industry. It has done something through the increased activity of the Board of Trade Commercial Intelligence Department—we have no desire to belittle the importance of that. Still less do we wish to underrate its significance—it must consistently lead the Government on somewhere else—but where?

Although we recognise that the Commercial Intelligence Branch has been doing its best under the circumstances, and that it will make more heroic efforts still in the interests of British trade, we cannot help feeling that it is at present severely handicapped. We may be wrong, but it seems that in at least two important directions it requires strengthening in *personnel*. It has been shown again and again that the ordinary tea and toy salesman cannot expect to succeed in the electrical industry until he has had some more or less specialised experience therein; that the British Consul is hardly the best class of representative to cultivate trade; and we believe it to be equally true that the average civil servant type of official requires, for the work of the Commercial Intelligence Branch, to specialise in certain departments, or else his services should be assisted or supplemented by somebody who is tolerably expert in those departments.

The Advisory Committee cannot be expected to fill the needs that we have in mind.

In another direction, too, strengthening might be introduced. We have felt at different times the benefit of being able to confer in London and in the provinces with national trade representatives returned afresh from the scenes of their labours. They have been able to tell us in conversation in half-an-hour more of the special things that we wanted to know than we could have ascertained in months by correspondence either with them or with the Branch in London. There are capable Commissioners representing this country in different parts of the world who have accumulated a most valuable knowledge of the markets in which they have resided, and it seems to us that their presence in London for the next few years would be of material aid to the Department and to British traders. In this connection we might do well to take a leaf out of the German Consular Service book, for in the Commercial Department in Berlin a strong point is made of having always at hand men with knowledge and experience of the overseas markets, able to explain the local conditions and the standing, &c., of the people doing business in those markets, to the home manufacturers and traders. There may be blame attaching to the latter for not paying frequent and thorough visits to the markets abroad, but the Consular representative could give them guidance which we doubt not would frequently encourage them to travel rather than justify their stay-at-home policy.

As our readers will have noted, there are as many schemes for the reorganisation of the Board of Trade as there are self-appointed reformers in these days. There always have been demands for modernisation in that department, and we have ourselves agitated that way, but we fail to see the wisdom of clamouring just now for a complete upheaval, for we cannot see that it is within the scope of immediately practical politics. Yet some action is required, and the Government ought to assist industry by announcing what, if any, new policy it proposes to introduce. The country is, if we understand its present temper, disinclined to be hampered by the trammels of the past, and it does not want a revival of old controversies; what it does want is to be able to assure its manufacturers who have done so much, and in so many ways, to assist the nation at a time of crisis, that something in the form of safeguards or assurances shall be given that the British markets shall not be the future playground for every German who pleases to come over here to undercut those who make present sacrifices to manufacture the things that we need.

As we have said before, the Government has enormous undertakings in hand, and nobody wishes to unduly hamper it in conducting these concerns efficiently, but it has had some very detailed, trying, overloaded, and fatiguing Sessions before, and present claims upon the Cabinet's attentions may not be greater than in those days. Every member of the Cabinet must have brought his mind to bear upon the question of Germany's future trade position in these islands and in our Colonies; doubtless all the members together have already discussed the subject in some of its bearings. We should be sorry to see them divided at such a time as this, but we do again urgently appeal to them to shake off this attitude of the closed lips, and say something for the guidance of British manufacturers.

It seems to us that it is not only manufacturers that need

to revise their methods of dealing with foreign trade, but also the Government.

It will be a matter for something more than regret if, when we write of the electrical industry in five years' time, we have to say that the greatest opportunity we ever had was allowed to slip by with only very small advantage accruing to the British manufacturer, because the Government of the day would not say the word necessary to give the justification for special efforts.

Just as we are writing we observe an important letter in the *Times* from Lord Cromer, who, writing as a Unionist Free Trader on the question of the aniline dye industry, admits that "a Protective tariff, bounties, subsidies, or a guarantee on share capital," though irreconcilable with the Free Trade doctrines "as heretofore accepted in this country," "can be justified on the ground of national emergency." He says other things as well which for our present purpose do not matter, but the above remark, we believe, represents the view of many others who would not have approved of it some months ago. "The ground of national emergency"—that is the crux of the whole matter. In an "Appeal to the Government," published in our issue of October 23rd, 1914, we requested the Cabinet to appoint a Commission to consider the bearing of the war upon the future of industry, and we asked it to consider the advisability of requiring all public money in future to be expended as far as practicable on British-made goods. We are interested to read now, in *Times* dispatches from Paris and Petrograd, that the Chancellor of the Exchequer and the Russian and French Ministers of Finance are to meet in Paris for a conference on financial questions "having special reference to furthering the cause of trade with Russia and the Allied States." This lends support to our suggestion expressed above, that future trade matters have been under discussion in our Cabinet. Though we have not secured the appointment of a Commission yet, it is pleasing to find that the Allies in Arms are about to consider officially the great question of remaining Allies in Trade.

The immensity of the Russian market, and the share in it which Germany has thrown away in the mad rush of militarism, surrounds this conference with a kind of glamour. That Russia will extend a preference of considerable value to us may be regarded as a certainty, but the problems of cheapening the cost of production, and of cutting the claws of tentacular financial control, are not going to be easily settled. The three European Allied Governments will, we trust, see their way to adopt a strong policy in commercial affairs which shall show the enemy that never again will her "will-to-power" policy be allowed to prevail in countries from which she has hitherto derived wealth which has enabled her to drench the soil of Europe with human blood. We credit the Chancellor of the Exchequer with ability to gauge the temper of the people, with a readiness to adjust his political thinking bringing it into subservience to national interests—as witness the Patents Act of 1907—and with a desire to confer with business men before he takes action in regard to matters in which he needs guidance from experts. We hope that before this Conference at Paris he has let down the plumb-line among British business men; or, if not, that he will do so when he is in a position to report upon the suggestions which it may be in the minds of our French and Russian Allies to make.

British Electrical Exports and Imports during 1914.

In accordance with our usual custom in January, we publish in this issue a series of curves which indicate at a glance the general trend of British electrical export and import trade during the past 12 months. The curves bear striking testimony to the effects of the war, which has led to a substantial reduction in the value of our export business, and the rapid replacement of Germany by the United States as the principal importer of electrical goods into this country. German overseas business has, of course, disappeared since the beginning of the war, but our American friends, with characteristic hustle, have more than made up the leeway, so that the imports, as a whole, have almost reached the monthly values prevailing before the war.

The shortage of labour, if not of plant, together with the partial dislocation of shipping and finance, brought about by the war, has tended seriously to handicap the efforts of our own manufacturers in foreign markets, and even internal electrical business, of which we have no record, doubtless gives place to the pressing necessities of the business of war and incidentally leaves an additional opening for the importer. The falling-off in our electrical exports shown by the curves does not necessarily mean any shortage of profitable employment by our firms; indeed, it may be quite the reverse.

Rubber.

The market for rubber has been much affected by a number of difficulties which have had to be faced and overcome, so far as possible, in connection with the export trade, which has been under more or less of a ban in consequence of the export prohibitions in force. Sentiment in this connection was particularly affected by the stoppage of trade with the United States, and this for a time was, indeed, the chief depressing factor. Some relief has, however, been lately experienced in this respect, since a compromise was come to between the Governments of the United States and this country as to a partial resumption of shipments under effective safeguards.

There has been a good deal of business moving during the last few weeks, and the market has shown a tendency towards recovery. American interests have re-entered the market as buyers, and have purchased very considerable quantities in anticipation of the development referred to. This has, of course, tended to stimulate the demand in other directions, and quite large quantities have changed hands. The market has shown a rallying tendency, prices having been advanced to about 2s. 3d. a lb. for No. 1 latex for spot delivery.

The position in the United States was at one time very stringent on account of the stoppage of shipments from this side, which naturally impelled the necessity of arranging for consignments from Brazil direct, which was a somewhat difficult matter. Prices of plantation rubber in New York were at one period run up to figures equal to about 3s. 9d. a lb. for fine grades, but there has since been some reaction. The market conditions were, of course, for a period rather artificial. The stocks in American consumers' hands are now believed to be very much reduced, and there is a continual drain upon the reserves of raw and manufactured material in connection with the pressing demand of the belligerent Powers on the Continent for tires, &c.

As regards the statistical position in Europe, there was last month a very considerable increase in the London stocks, in consequence of accumulated arrivals, but in the course of this month the deliveries have been improving, and it is generally presumed that the present stock will be lessened by slow degrees.

Supplies have been coming forward from the Near East more freely, the total December exports from the Federated Malay States being a record, at 3,361 tons, making a total for the 12 months of 30,697 tons, which compares with 23,463 tons in 1913 and 15,507 tons in 1912.

The state of the manufacturing trades in Russia has been decidedly more encouraging, requirements in that country having assumed much larger proportions, and this may be regarded as an important factor in connection with future developments in crude material. In Germany rubber is very scarce, and manufacturers' operations in many cases have had to be suspended, the State having first claim upon everything available. The fact is considered as being rather significant that the German Government has entirely prohibited the selling of such articles as motor-cars and their tires, except under permits, which sufficiently explains the conditions which are beginning to obtain there.

ELECTRIC LIGHTING AUTHORITIES AND THE LAW OF RATING.

[FROM OUR LEGAL CONTRIBUTOR.]

(*Concluded from page* 103.)

The application of the principle of this case was illustrated in the assessment of the property of the Charing Cross Electricity Supply Co. (see Konstam's Rating Appeals. page 22). The company had a generating station and mains in the parish of Lambeth, but they did not supply electricity in that parish. They supplied electricity in all the parishes of the City of Westminster, in respect of which there was an appeal, and elsewhere. The greater part of the electricity supplied by the company in Westminster was brought by them from the generating station in Lambeth, but a part was brought from another generating station at Bow. The company had a sub-station situated partly in the parish of St. Martin-in-the-Fields, and another sub-station wholly in the parish of St. Martin-in-the-Fields, besides sub-stations elsewhere. The property in Lambeth, therefore, consisted entirely of indirectly productive works, and that in Westminster partly of directly and partly of indirectly productive works. The capital value of the indirectly productive portion was estimated at £543,666, and of the directly productive portion at £314,696. In the event, the generating station and mains in Lambeth were estimated at £16,106, with a rateable value of £8,053, while the other properties in the Westminster parishes were estimated at £35,559 gross and £19,000 rateable.

Unfortunately for those whose duty it may be to ascertain the rateable value of electric light works in the future, the report of this case gives but a vague idea of the method adopted in arriving at the figures. Nevertheless, the following conflicting figures with regard to repairs and renewals are of interest. Mr. Patchell stated that, in his opinion, the proper amounts to be set apart annually for renewals were, in the case of—

Mains, 3 per cent. on the capital value.		
Buildings, 1½ per cent.	,,	,,
Accumulators, 10 per cent.	,,	,,
Other plant, 5 per cent.	,,	,,

Major Cardew, however, who gave evidence for the rating authorities, said that the proper allowance for repairs and renewals of accumulators was 8½ per cent. of their value. The mains had, in his opinion, an average life of 40 years, and would be worth 12 per cent. of their prime cost at the end of that time. The sinking fund necessary to replace them would be 1·14 per cent. of their value, and not more than 2 per cent. would be necessary for the annual repair of the mains. Unfortunately, the report of the case to which we have been referring does not state which of these two sets of figures was acted on by the rating authority.

Rating of Works in Excess of Existing Requirements.—It often happens that electrical undertakers have extra space, and sometimes spare plant, which is in excess of their existing requirements, and is laid down for the purpose of meeting extensions in future years. The question whether this part of the property is to be brought into rating has been considered in a number of cases, but not electric supply cases. In R. *v.* South Staffordshire Waterworks, 1885, 16 Q.B.D. 359, the indirectly productive works were largely in excess of the then existing requirements of the company, and had been constructed for use in future years. The rateable value of the whole system was agreed, the point in dispute being the proper amount of deduction to be made therefrom. It was found that if only so much of the permanent works as was required for the purposes of the present supply was brought into rating, the rateable value of the whole would be materially diminished. The following passage from Lord Esher's judgment in the Court of Appeal serves to show the attitude taken up by the Court:—

"There might be works of the undertaking which had not become part of the actual system, as, for instance, a reservoir, or a second lot of engines not yet used at all, but constructed with the view of becoming part of the works in the future. Such could be no part of the existing system of works, but would be intended for another system, and would, of course, be rejected in making the calculation. But that is not the case, for here every part of the works is in actual use, though they are too large for the supply of water at present required. . . . But as the works in use are in excess of the present requirement, a tenant taking the whole or part of the property in a particular parish ought not in justice to be asked to pay the same rate of rent as he would if all the works were earning profit. Therefore, if the 3¼ per cent. mentioned by the arbitrator is the ordinary percentage upon the value of the capital laid out, one would think that the percentage in this case should be reduced to 3 per cent. or less." It would seem from this case that it would be perfectly proper for a rating authority to make a reduction on account of the spare space inside a generating station. The question whether there could be a reduction for a spare "set" is rather different, because prudent people would not run a large station and undertake to give a continuous supply without making provision for breakdown.

Where a Local Authority are the Undertakers.—It was at one time thought that if a municipal corporation or other similar body occupied land, and the whole of the profits of the corporation were by statute devoted to public purposes, the corporation had no beneficial occupation and were not rateable. This, however, is an erroneous view, and all such property now comes into rating, although, as the local authority has to spend the rates, or a greater part of them, the money is to a large extent taken out of one pocket only to be put into another.

Should anything occur to render the undertaking of an electric lighting company less profitable, it is conceived that a reduction may be obtained, but it is clear that the cause must be of a permanent nature. In R. *v.* Islington Assessment Committee 30 T.L.R. 149, it appears that by Sec. 47 of the Valuation (Metropolis) Act, 1869, where in the metropolis a requisition is made to the overseers to send to the Assessment Committee a provisional list showing a reduction, from any cause, in the course of any year, of the rateable value of a hereditament, and the overseers make default, the Assessment Committee must appoint a person to make such provisional list. The London County Council were the owners and occupiers of tramways in the Borough of Islington. In 1912 and 1913, owing to the competition of motor-omnibuses, the gross receipts from the tramways had fallen from 11·42d. per car-mile to 9·05d., and on April 4th, 1913, a requisition by the London County Council was served on the Islington Borough Council, as overseers of the parish, requiring them to send to the Assessment Committee a provisional valuation list showing the reduction in the rateable value of the tramways, on the ground that they had been reduced in value within the meaning of the section. The Borough Council declined to accede to the requisition, and on an application by the London County Council to the Assessment Committee that body came to the conclusion that there was "no *primâ facie* evidence of such a reduction as is contemplated by the section," and they, therefore, declined to appoint a valuer. It was held by the Court of Appeal (Vaughan Williams, L.J., dissenting), that the Council had failed to make out a *primâ facie* case of a reduction in value resulting from a cause of a permanent nature, that the comparison ought to be with the circumstances which established the value of the hereditament at the time of the quinquennial valuation, and that, therefore, a mandamus ought not to issue to the Assessment Committee to appoint a valuer.

The importance of being fully prepared to dispute the right of the Committee to raise the rateable value is illustrated by the case London County Council *v.* Shoreditch Borough Council (105 L.T. 515). It is apparent that in some circumstances the decision of the Assessment Committee is final, and cannot be appealed to Quarter Sessions. In the case in question the appellants, as owners of tramways in a borough, had constructed a new curve for relieving congestion of traffic, and reconstructed certain lines for electric traction. In consequence of this alteration the respondents, as overseers, raised the rateable value of the tramway lines by a provisional list to the extent of a £1,000. The appellants appealed to the Quarter Sessions

for the County of London against a general rate based upon the provisional list. It was held that as there was evidence before the Assessment Committee of alterations in the hereditament, the question whether they had rightly come to the conclusion that such alterations had resulted in an increase of value, was not one which could properly be raised on appeal to the Quarter Sessions.

THE NATIONAL ELECTRICAL CODE AND BRITISH WIRING RULES COMPARED.

By FRANK BROADBENT.

(*Concluded from page* 122.)

"Snap" switches are not manufactured in this country in sufficient quantities to justify extended reference to the National Code regulations concerning them. On general points the rules follow the lines laid down for knife switches. The leakage surface is to be not less than 3/64 in. between supporting screws and live parts; conducting covers must be lined with an insulating material not less than 1/32 in. thick. The test is 50 per cent. current overload for switches rated below 10 amps., and 25 per cent. overload for larger sizes. A duration test is also specified, viz., 6,000 "makes" and "breaks" at a rate not exceeding 10 times a minute.

The rules for circuit breakers are generally similar to those for knife switches in so far as they are applicable.

It is not quite clear what is the overload test for breakers, the rule reading as follows:—"must successfully operate three times with two minutes intervals intervening without incapacitating the breaker, the conditions of testing current to be as given in the following table:—

Current rating of breakers.	Percentage of voltage drop in test circuit with rated current flowing.	Minimum available capacity of supply system, not including overload capacity.
0 to 100 ...	2 ...	1,000
100 „ 300 ...	3 ...	3,000
300 „ 400 ...	4 ...	4,000
400 „ 500 ...	5 ...	5,000

No filing of contacts or other repairing of the breaker to be done during the tests.

This rule leaves something to the imagination, and one may suppose that it means a short circuit test, the resistance of connecting leads representing the cable resistance which might be in circuit under the conditions of actual service. On this basis let us see what the overload current would be in a given case. Take the case of a 500-ampere breaker on a 500-volt circuit. The voltage drop with 500 amperes passing will be 5 per cent of 500, or say 25 volts, hence the resistance in circuit equals 25/500=0.05 ohm. A short circuit would therefore permit of the passage of a current equal to 500/.05 or 10,000 amperes, which is 20 times the capacity of the breaker. But, working on this assumption we arrive at the same value, 10,000 amperes, for every circuit breaker rated above 100 amperes when used on any voltage. It is desirable to have the exact meaning of this test made clear for the benefit of British manufacturers.

On the question of cables and their erection the National Code rules are in some respects more stringent than ours, the following being some of the points of difference. Whilst our Institution rules permit of the use of hard wires having a section equal to that of a No. 18 S.W.G. (.0018 sq. in.) the National Code minimum size is No. 14 B. & S. (.0032 sq. in.) or about the equivalent of our No. 16 S.W.G. Hard stranded wires must be soldered before fastening under clamps or binding screws. Where cables pass through walls, timber, or partitions, a *conducting* bush, such as an iron pipe, long enough to pass through the hole in one continuous piece is to be used, the ends to be bushed with an insulator.

We have no exceptional rules relating to the quality of cable insulation to be used for open wiring, but the National Code prescribes wires having an approved rubber, slow-burning weatherproof, or slow burning insulation.

On wood casing or conduit installations the National Code does not permit joints or taps except in approved fittings, and the wire is to be in continuous lengths from fitting to fitting. Threading is not allowed, the complete conduit system must be first erected and the cables drawn in afterwards. Not more than four two-wire or three three-wire circuits to be drawn into one conduit. Our Institution Rules do not impose any limit, but the Edinburgh Corporation rules specify that not more than four wires are to be drawn into one tube. This is a very sensible regulation and is more stringent than the National Code which as shown above allows eight or nine wires.

As in hard wires, so in flexible and fitting wires the National Code is more stringent than our rules are, the minimum section allowed by the former being the equivalent of a No. 18 B. & S. (.00127 sq. in.) against the equivalent of a No. 22 S.W.G. (.0008 sq. in.) allowed by the Institution for flexibles, and 3/25 (.0009 sq. in.) for fittings. Such differences as exist in the rules regarding erection are largely accounted for by the differences in the character of the constructional work of buildings, *e.g.*, "frame" buildings, typical of American constructional methods, are practically unknown in this country. A very important rule in the National Code is that which insists on the bushing of all pipe outlets where they enter junction boxes, distribution boxes and the like. Our rules only ask for the bushing of "free ends" of conduit and it is unfortunately not the practice to bush the pipe ends where they enter boxes and fittings. If this were the common practice it would remove one of the two weak points in conduit work, the other being internal condensation. Whilst "sharp bends and elbows" are prohibited by our rules there is no limit as to the number of bends which may be used in one pipe circuit, or say between draw-in boxes. The National Code imposes as a limit the equivalent of four quarter bends not counting the bends at the outlet, and specifies that radius of any elbow shall not be less than 3½ in. It is no doubt owing to the extraordinary height reached by American buildings that a limit is set to the unsupported vertical length of cables run in conduit, the length ranging from 35 ft. in large sizes to 100 ft. in small sizes. The method of support may be a right-angle turn in the conduit system or by insulating supports in junction boxes. As regards the earthing of conduit the National Code does not differ materially from the Institution rules, but it allows earthing to gas pipes on the street side of the meter, a practice distinctly prohibited by the Institution rules.

Concerning cables, the Institution rules, whilst of a more or less general character, laying down the conditions to be fulfilled rather than a detailed manufacturing specification, are more detailed than in the case of switches and other accessories. This is quite understandable when we consider the important functions of the cable and the fact that it is generally concealed and practically inaccessible when once erected. The National Code on the other hand, besides being much more specific and comprehensive in regard to the installation of cables, devotes considerable space, almost 20 pages, to details of construction and the tests to be applied.

According to our Institution rules all covered copper conductors having a greater section than No. 14 S.W.G. (.005 sq. in.) must be stranded, but there appears to be no limit imposed by the National Code nor is there a standard given for conductivity

corresponding with our E.S.C. standard which is the standard adopted in our rules.

According to the American Code the copper for insulated solid conductors of No. 4 B. & S. (.2043 in. diameter) and smaller must not vary in diameter more than .002 in., and larger solid wires must not vary more than 1 per cent. from the standard, whilst the E.S.C. standard permits a variation of 2 per cent. from the standard conductivity, an allowance of 1 per cent. for tinning and an allowance of 2 per cent. for the lay of the wires in stranded cables (excepting the centre wire). The National Code stipulates that solid wires shall have a conductivity of not less than 97 per cent. of that of pure copper, and that the conductivity of the individual tinned wires of a stranded cable shall be not less than the values given in the table. The table starts at No. 14 B. & S. (.0641 in. dia.) with 97 per cent. conductivity which decreases by .2 per cent. for each successive reduction in gauge until No. 30 (.01 in. dia.) is reached when the conductivity is 93.8 per cent. There is an allowance of 1½ per cent. permitted between the nominal circular mils. of the strand and the sum of the individual circular mils. of the wires.

The labels on the coils must indicate the maximum voltage for which the cables are to be used, the name of the manufacturer, the month and year when manufactured, the class or grade, and the words "National Electrical Code Standard."

There are 8 grades or classes referred to, each to comply with definite specification and to pass prescribed tests.

The classes are: (1) rubber covered, (2) slow-burning weatherproof, (3) slow-burning, (4) weatherproof, (5) flexible cord, (6) fixture wire, (7) conduit wire, and (8) armoured cable. The requirements are much too long to give in full and are too detailed to permit of condensing satisfactorily. The pressure tests for rubber cables differ materially from ours which prescribe the application of 1,000 volts for half-a-hour after 24 hours immersion. The National Code tests vary with the thickness of insulation thus for thicknesses up to 3 sixty-fourths of an inch the test pressures are 3,000 volts a.c. per 64th. But for greater thicknesses the pressure per sixty-fourth gradually decreases as the thickness increases until a thickness of sixteen 64ths is reached for which the pressure is 28,000, or 1750 volts per 64th. The test is to be made on 1 ft. of cable after 72 hours immersion, and is to start with 3,000 volts a.c. for 5 minutes, to be increased by 3,000 volts at 5 minutes intervals until rupture of the insulation occurs. In addition to this, every complete length is to be tested after 12 hours immersion by the application for one minute of an a.c. voltage varying from 1,500 volts for a thickness of insulation of three 64ths up to 3,500 volts for a thickness of ⅛ in. The insulation test follows this, the test pressures ranging from 4,000 volts to 17,000 volts being approximately 2½ times the maximum working pressure, the insulation ranging from 100 to 600 megohms, in the 1,500-volt cable and from 200 to 1,200 in 7,000-volt cable. These figures are much lower than is the recognised practice in this country for V.I.R. cable, where the 600 megohm *grade* ranging from 600 to 1,250 megohms is required on voltages up to 250 and the 2,500 megohm *grade* ranging from 2,500 to 4,500 megohms on higher voltages within the limits of medium pressure, viz., 650 volts.

In addition to the foregoing test any completed length may be tested at any time during 30 days immersion in water and must show not less than 50 per cent. of the I.R. registered—after the 12 hours immersion. All tests are based upon a temperature of 60 degrees F. and a multiplier is given for temperatures ranging from 50 degrees to 85 degrees.

A stretching test is also prescribed which is interesting, and something of this nature would form a useful addition to our own rules. For thickness of insulation less than five 64th in. a test piece is to be stretched to 2½ times its normal length at the rate of 12 in. a minute and immediately released, when it must return to not more than 125 per cent. of its original length. It must also stand stretching to 3 times its normal length before rupturing. For test pieces from thicker insulation the limits are 2 and 2½ respectively instead of 2½ and 3 as specified for the thinner insulation. The tensile strength is to be 400 lb. per sq, in. It would surely be a very poor sample of new cable which failed to pass the stretching tests imposed. Cable tested at any time within one year of the date of manufacture must pass a less severe stretching test than the foregoing, namely about, twice instead of 2½, and 1¾ instead of 2.

We have still not finished with the tests, for five chemical tests are specified, viz., acetone extract, alcoholic potash extract, chloroform extract, ash and and total sulphur, and the sum total of the results shall not exceed 80 per cent. by weight of the total compound. This synopsis covers only the first of the eight classes of cable enumerated, but sufficient has been said to indicate generally the kind of conditions and tests to which cables are subjected, and those who are sufficiently interested in the other sections are referred to the Code itself.

The requirements as to steel conduit, in addition to those referring to erection, cover standard sizes and thickness, finish, bending tests, etc., and also interior lined conduits which notwithstanding the late Mr. F. Bathurst's strenuous advocacy, have never gained a secure foothold in this country. The National Code does not recognise slip socket at all, and their conduit appears to be much thicker and heavier than ours. As the American sizes are denoted by their internal and British sizes by the external diameters, comparison is somewhat difficult. The smallest American size is rated as ½ in. conduit, although the internal diameter is .62 in., whilst the smallest British standard is ⅝ in. conduit, this being the outside diameter. The minimum American thickness is .1 in. for ½ in. conduit, and the British is .064 in. for the ⅝ in. size; and for a 2 in. which is the largest standard British size the thickness is .092 against the American .15 in. In order to arrive at the internal diameter of British standard conduit (E.S.C.) this being the really important dimension, it is necessary to deduct twice the thickness from the outside diameter,, and as the diameters are given in fractions and the thicknesses in decimals this cannot be done without a preliminary conversion.

The following tabular comparison shows the wide divergences in the practice of the two countries, and serves to explain another of the causes of the high cost of wiring in the States. In the table the letter "B" means British and "A" American standards. Owing to the fact that the British standard is based on the external, and the American on the internal diameter it is impossible to compare two pipes of the same nominal size, moreover neither the internal nor external diameters of the American conduits

COMPARISON OF AMERICAN AND BRITISH CONDUIT.

Nominal size in inches.		Internal diameter in inches.		Thickness in inches.		Outside diameter in inches.		Minimum weight per 100 ft. in lb.	
B	A	B	A	B	A	B	A	B	A
⅜	—	·497	—	·064	—	·625	—	37·4	—
¾	—	·606	—	·072	—	·75	—	51·0	—
—	½	—	·62	—	·100	—	·82	—	75
1	¾	·856	82	·072	·105	1 00	1·03	69·8	104
1¼	1	1·106	1·04	·072	125	1·25	1·29	86·5	152
1½	1¼	1·34	1·38	·080	·135	1 50	1 65	119·0	209
2	1½	1·816	1·61	·098	·140	2 00	1·89	184 0	250
—	2	—	2 06	—	·150	—	2·36	—	350

correspond with the nominal rating, thus what is called a ½ in. conduit measures .62 in. internally and .82 in. externally and so forth.

Many more interesting comparison might be made between the respective practices of the two countries, particularly in the matter of wiring accessories, but sufficient has been said to indicate that whilst in some respects the National Code is more stringent than the British, the differences do not give any greater security; and further, that considerable modifications in details will have to be made in certain British manufactures if it is hoped to obtain a greater share of the Canadian trade. There is little doubt that in some respects the regulations will be modified during the forthcoming revision, but it is doubtful if any modifications which may be made will have for their object the bringing about of a closer degree of uniformity with British practice; they will be made more with a view to cheapening the cost of conduit wiring lest perchance some new and cheaper system should threaten it.

A MERCURY RECTIFIER LOCOMOTIVE.

ACCORDING to the *Electric Railway Journal*, the Westinghouse Co. has been trying for some months a motor car provided with the Westinghouse-Cooper Hewitt mercury arc rectifier locomotive equipment. This consists of a step-down transformer for 11,000/1,200 volts with secondary taps for varying the pressure; two single-phase rectifiers, one being reserve; four D.C. motors of 1,000 H.P. total capacity, and the necessary control apparatus, rectifier-exciter, etc.

The equipment is installed in a car belonging to the Pennsylvania Railway, and was first tried on the Westinghouse test track at Pittsburgh. Later to obtain service conditions it was transferred to the electrical zone of the New Haven Railroad and is now running on the New Canaan branch of that company. After preliminary trials it was put into revenue service, hauling trains, and to date has been operated more than 20,000 miles. Its present schedule calls for a daily mileage of 240. These tests were designed to demonstrate the durability of the equipment under general service conditions, such as sustained high voltage, voltage fluctuations, as well as mechanical shocks and vibrations.

The fundamental parts of the equipment and the circuit connections are shown in the accompanying diagram. Current is drawn from the 11,000-volt overhead contact wire through the standard pantograph of the New Haven Railroad. It flows through a line switch and the primary winding of a lowering transformer to the rail return. The transformer secondary is provided with a centre tap and with a number of others equally spaced two by two from the centre on both sides to permit the varying of the A.C. voltage from zero to the maximum. The centre tap connects with the terminal of a group of four motors connected permanently in series-parallel. These motors are standard Westinghouse No. 308, wound for 600 volts. The group is grounded at the centre to limit the D.C. voltage between any point in the equipment and ground to 600. The outside secondary transformer terminals connect to the two positive electrodes at the top of the rectifier. The remaining connection is from the mercury or negative terminal of the rectifier to the other terminal of the motor group.

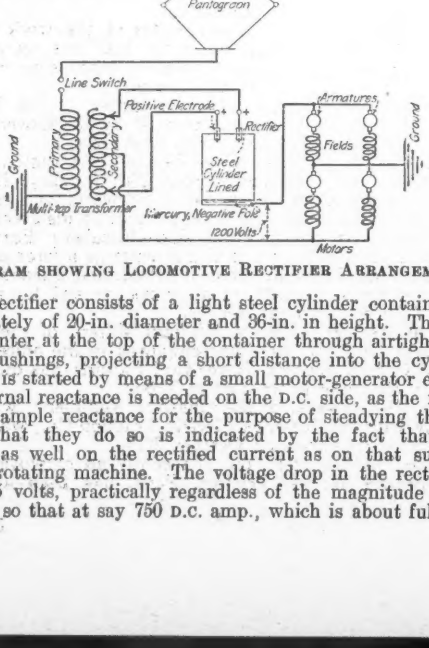


DIAGRAM SHOWING LOCOMOTIVE RECTIFIER ARRANGEMENT.

The rectifier consists of a light steel cylinder container approximately of 20-in. diameter and 36-in. in height. The electrodes enter at the top of the container through airtight insulating bushings, projecting a short distance into the cylinder. The arc is started by means of a small motor-generator exciter. No external reactance is needed on the D.C. side, as the motors furnish ample reactance for the purpose of steadying the current. That they do so is indicated by the fact that they operate as well on the rectified current as on that supplied from a rotating machine. The voltage drop in the rectifier is about 25 volts, practically regardless of the magnitude of the current, so that at say 750 D.C. amp., which is about full load for the motors, the power loss is 18¾ KW. and the efficiency, at 1,200 volts, is very high.

Details of the cooling system, electrodes, exciter connections, etc., are not yet available.

The rectifier weighs but a few hundred pounds, and the motor car complete weighs 72 tons. The rectifier equipment is mounted in the baggage compartment and occupies, with the switch groups and transformer, not more than one-half the floor area.

WAR ITEMS.

Manufacturing Works in Germany.—The general meetings of the leading manufacturing companies in Germany have now taken place, but beyond the extraordinary speech which was delivered by Dr. Walter Rathenau, and to which attention was recently drawn, very little information of importance has been allowed to transpire. In the case of the Siemens-Schuckert Works Co., which is a private company owned by the two firms indicated in its title, no annual assembly is necessary or is held in public, but Dr. von Petri, general director of the Schuckert Co. of Nuremberg, informed the shareholders in the latter company at the recent meeting that the works of the Siemens-Schuckert Co. in Berlin and Nuremberg had rapidly accommodated themselves to the conditions of war and were sufficiently well employed, activity in the war departments in particular being considerable. At the assembly of the A.E.G. it was mentioned that the turnover in the year ended last June amounted to £26,000,000, as compared with £22,000,000 in the preceding year, and that the trade with hostile countries represented £4,750,000 of the former total. The orders invoiced to domestic consumers and neutral countries by October 31st, 1914, amounted to £6,250,000, whilst the value of the orders then on hand reached £15,500,000, exclusive of £6,500,000 held by subsidiary companies in hostile countries on June 30th, the outstanding debts in the countries being £1,000,000. As to the degree of employment in the first four months of the new financial year, it was explained that, reckoned in working hours, this bore the relation of 2 to 3 as compared with the equivalent term in 1913. The Siemens and Halske Company, although acknowledging a material reduction in the orders on hand for articles of peace, stated that the works were sufficiently occupied as a result of the abundance of orders allocated by the military and naval authorities. Speaking generally, it was submitted that as one-third of the workers in trade, industry and agriculture had been called to the colours—that is by the first week in January—it might be expected that a general reduction in the output of one-third would take place, and that the profits would be curtailed to a similar extent. Apart from the manufacturing companies, the electricity supply works are also suffering from a diminution in the consumption of energy for lighting and power purposes, except in those cases where firms are engaged on the production of war materials; and with the increasing scarcity of raw materials, especially metals, it is probable that the degree of activity in manufacturing and in the supply branch will tend to decline further, particularly when it is taken into consideration that small pecuniary payments are being offered in certain districts for the recovery of spent and live cartridges, shells, etc., which may be found in the field.

Prospects in China.—Dealing with the war's effect on trade in South China, the United States Consul at Hong Kong calls to mind that for some time past all railway and industrial undertakings of magnitude in China have depended upon foreign loans for realisation. Loans for such purposes in China in the near future will be out of the question, and there is, therefore, little likelihood of any railway work of magnitude being carried on perhaps for years to come, other than that already arranged for. A similar prospect is ahead for all important public works. In foundries industrial establishments, such as electric lighting plants, there will be a similar restriction, although it is hoped that enough Chinese capital may be enlisted in certain directions to lead to some development of the most promising undertakings. It is likely that one result of the war will be a marked change in the course of railway and similar concessions in China. The general machinery of trade, of course, has been interfered with greatly. While German and Austrian firms continue to do business in the open ports of China, the restrictions placed upon dealings between them and British, French and allied firms are such as to make trade almost out of the question. In Hong Kong German houses have been allowed to continue business by special licence of the Government to the extent of liquidating contracts made previous to the opening of the war, but they are not allowed to enter upon any new contracts. The result is that their business organisations are being destroyed, their employés are idle, and in many cases have of necessity been discharged, their Chinese connections are being broken up, and in general the whole machinery of trade is being badly crippled. Many of these German and Austrian firms are important factors in the trade with the United States, and their embarrassment is materially affecting American interests concerned in Hong Kong trade. Not only is an unusual opportunity for building up new business afforded by the collapse of trade machinery under the war, but, as stated, this same collapse has thrown out

of employment many men of long experience and established connections in various lines of import and export business whose services would be of the greatest value to new concerns attempting to establish connections in the trade. The services of such men might be had at the present time far more reasonably than under other circumstances, while their knowledge of the field of trade here and in other countries, of buying and selling connections,, and of the trade generally, is something that can be acquired only by years of service.

The War and German Cables.—The fact that the German submarine cables were cut by the British navy at the beginning of the war is keenly felt in interested circles on the other side of the North Sea, the two cables connecting with the United States having been severed off the Azores as early as August 5th. Professor Meister, of the Munster University, Westphalia, who recently delivered a lecture on the "English Cable War," stated that owing to the English policy of destruction Germany has been isolated from all ex-European telegraphic traffic in a way that would not have been regarded as possible prior to the war. It will therefore be necessary, in his opinion, for that country to protect itself in the future by the adoption of a systematic policy for the prevention of such isolation. For this purpose he declares that all that is required is a single direct American cable from the United States to Germany without any intermediate landing place, which would belong to the United States and which Great Britain would guard herself against cutting. The Professor thinks, however, that a safer scheme would be for the establishment of an American-owned cable between the United States and a neutral country, as, for instance, Denmark or Sweden, and thence onwards to Germany. At any rate, it is considered that a solution must be reached as soon as possible by the creation of a German world's cable system which would be independent of that of Great Britain. As to the objection that submarine cables could be replaced by wireless stations, Professor Meister remarks that it is also possible to destroy the latter in time of war, as in the case of the stations at Togo, the Cameroons and in East Africa, whilst the wireless system in the present stage of science is unable to afford a complete substitute for submarine cables, which now, as in the future, must act as a complement of the former.

The Position in Austria.—A little light on the situation of affairs in Austria is thrown by the report of the United Electricity Co., of Vienna, for the year 1913-14. Although solely occupied as an industrial company since its supply works were acquired by the Vienna municipal council a year or so ago, the company is yet interested both in supply and manufacturing undertakings in Austria-Hungary, and it is to the statements made in regard to these that attention might be directed. In the first place, it is mentioned that the activity of the supply companies in question is being detrimentally affected by the effects of the war, inasmuch as the sale of energy for lighting and power purposes has taken a downward course, while on the other hand a large decline has occurred in the traffic on the electric tramways and railways served by some of the companies. The question as it applies to the manufacturing companies, however, is of greater importance. The report states in this connection that with the exception of certain contractors for the delivery of war materials, the degree of employment of the electrical firms has greatly diminished in consequence of the extraordinary limitation in the orders placed by public authorities and private undertakings, as well as through the total cessation of the export trade.

Trade War Exhibition.—A concerted effort on the part of representative business men to further the campaign for the capture and retention of enemy trade, was inaugurated at the Mansion House on January 21st, when Sir William Bull, M.P., presided over the first meeting of the General Advisory Committee of the National "Trade War" Exhibition. The exhibition, which it is proposed to hold in London at an early date, will include a display of goods manufactured in Germany and Austria, and exhibits of British goods by which they can be superseded. There will also be lectures and discussions dealing with subjects of interest to manufacturers and traders. An executive committee has been elected, and Mr. F. H. Payne was appointed Organising Commissioner. All communications should be addressed to the Organising Commissioner, National "Trade War" Exhibition, Central Hall, Westminster, S.W. A public appeal is to be issued for a £10,000 guarantee fund.

Recruiting Tramcar at Rochdale.—An illuminated tramcar, gaily set out with patriotic devices and coloured lights, arranged by the Tramways Committee of the Rochdale Corporation in conjunction with the Parliamentary Recruiting Committee of Rochdale, to assist in the work of securing men for the army, has been out for service on various routes for a week and has been well patronised. The additional receipts have almost paid for the cost of the decorations and illuminations. The car is to be kept in service for another fortnight at the least.

A Rochdale Problem Reconsidered.—The Rochdale Tramways Committee has reversed a decision which had been arrived at respecting an application from a man who, before the war, was training for service as a conductor, and who, since war was declared, has joined the colours. By a majority of one vote, as reported in our columns two or three weeks ago, the Committee had decided that the man in question was entitled to the half-pay which the Committee had granted to men who were on the staff before war was declared and who have since joined the colours. At a meeting of the Committee on January 20th, it was legally ruled that the man was not an employé when war broke out, and the previous decision to grant him the half-pay was rescinded.

Electric "Fall In."—At the request of the Chief Recruiting Officer for London (Captain Passingham) metropolitan borough councils which own electricity works are to have illuminated electric recruiting signs for night use affixed to the standards of street lamps in their districts, intimating to men of military age the nearest recruiting stations in the various localities in the metropolis.—"Standard."

Telegraphists at the Front.—On Friday last Colonel A. M. Ogilvie, Second Secretary of the Post Office and Director of Home Signals, unveiled a handsome scroll containing the names of 447 telegraphists who had left the Central Telegraph Office for active service. The Controller of the Central Telegraph Office (Mr. J. Newlands) presided, and stated that the scroll was a gift of the girls of the department. Over 500 telegraphists have left the office, and more are to follow. The total number of men serving with the colours is now over 30,000, of whom 4,000 are from the telegraph force.

Bradford Employés and the Relief Fund.—The complete list, to date, of employés' contributions to the Bradford Lord Mayor's War Relief Fund includes those of the employés of the Corporation Electricity Department, eighteen contributions, £167 6s. 8d.; of the tramways workers, sixteen contributions, £759 10s. 10d.; and of Messrs. C. Pratt & Sons, Ltd., electrical contractors, twenty contributions, £12 15s. The total contributions of Bradford Corporation employés to the fund have amounted to over £5,000.

Edinburgh Tramwaymen.—Since the commencement of the war 300 men of the Edinburgh and District Tramway Company's service have joined the different units of the army. In the case of married men who have joined the forces the company have made up the difference between Government allowance and full wages, and in the case of single men the company are allowing each man 10s. per week. Up to date their allowances have cost the company nearly £2,000.

L.C.C. and Alien Firms.—The Stores and Contracts Committee of the London County Council reports that, as the result of inquiries with regard to firms controlled wholly or largely by enemy aliens, whose tenders or quotations had been accepted by the Council, it has decided to have no further dealings with 28 such firms, and their names have been removed from any lists of firms to be invited to tender for the supply of stores, etc.—"Times."

Australia and Enemy Trading.—The "Times" states that the High Commissioner for Australia has received advice from the Commonwealth Government that Consular certificates of origin will be required in respect of all goods shipped to Australia from places situated in Norway, Sweden, Denmark, Holland, Switzerland, and Italy, on and after February 1, 1915.

German Trade.—Referring to the Board of Trade Exchange meeting recently noticed in this column, the Stonebridge Electrical Co., Ltd., of Willesden, write to say that they supply small milliampere-meters and pocket voltmeters such as were exhibited, but of much better finish than the latter.

Stockport Tramwaymen.—Some slight curtailment of the tramway services has had to be made at Stockport owing to the fact that 71 employés in the department have left to join the colours, and that it has not been possible to fill up their places.

Siemens' Employés' Contributions.—The employés of Siemens Bros. Dynamo Works, Ltd., Stafford, have sent £62 7s. 11d. to the Mayor's National War Relief Fund, the sum being five weeks' contributions.

Personal.—Owing to the exigencies of the work of the Woolwich Electricity Department, the B.C. has not granted Mr. E. Mawdesley, assistant engineer, permission to enlist in a combatant capacity in the Army.

Mr. W. J. Leeming, electrical engineer to the Buxton U.D.C., has had his services accepted by the Government, and will be attached to the Royal Engineers.

Professor Alfred Schwartz, of Redcliffe, Orpington, Kent, informs us that by deed poll dated 20th January, 1915, he formally renounced his surname of Schwartz and assumed the surname of Barnes (the maiden name of his great-great-grandmother on the paternal side—Elizabeth Barnes, b. 1731), and adopted the name of Schwartz as a forename and addition to his Christian name of Alfred, and intends henceforth to describe himself on all occasions and for all purposes as Alfred Schwartz Barnes.

Roll of Honour.—Private William Millan, of the Highland Light Infantry, who was employed in the office of the Scottish Central Electric Power Co., Falkirk, has died from enteric fever while in training at Troon.

Sergt. Alec. Evans, of the Cheshire Regiment who was formerly with the Potteries Electric Traction Co., was killed in action near Chapell on October 27th.

Private Fred Ashcroft, up till recently an employé at the Westinghouse Works, Trafford Park, has been killed in action.

D

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Advertising and Character.

With reference to Mr. Turner's letter in your issue of 22nd inst., I must congratulate that gentleman (an American by "instinct"—whatever that means) on his subtlety in extracting a personal compliment from what was intended to be a statement of a difference in temperament, but, logic, surely, should prevent him saying, as he does in effect, that because A is fat and B is thin therefore A is a wise man.

To appreciate the distinction I tried to draw, not offensively, I can only suggest that your correspondent should compare the selling methods of a West End tradesman with those of a New Cut coster. It may be quite true that Bill Sykes of the New Cut, who is a monogamist by "instinct" and a temperance advocate, is far superior to William Sykes, Esq., of Oxford Street, who is neither, but Bill has an unfortunate habit of screaming his wares.

I do not like "screams."

"Mr. Contractor! If you're alive, get busy! right now!" Yah!

E. J. Reed.

London, S.W., *January 22nd*, 1915.

Evidently I did not make myself clear in my former letter, as Mr. Herbert Berry has missed my meaning. I stated that "an advertisement should reflect the character of the firm issuing the announcement." What I intended to convey was that the "style" of the advertisement, that is, its appearance, should be in harmony with the advertiser's business. The same applies to a great extent to the text.

For instance, methods of advertising which would be applicable to a turbine maker might be ineffective if adopted by a manufacturer of electrical accessories, such as fittings, ceiling roses, etc. In other words, the advertisement should be designed to appeal to the buyer of the goods advertised. Mr. Herbert Berry says the two are opposed. I would like to know in what way? It seems to me that the two are identical.

By no means is it impossible to appeal to the various sections of buyers in turn—to "ring the changes," as Br. Berry calls it—and to retain the same general "style" throughout the entire series of advertisements.

To keep changing from one type of display to another means the risk of losing one of the most valuable advantages of advertising, viz., cumulative effect, which really means "goodwill." In a manner, you may liken this to a firm which changes its name frequently. With the adoption of the new title they have to inform all concerned of their action, and this frequently leads to mistakes and invariably means that a certain number of customers are lost. The analogy may be a poor one, but I think Mr. Berry will see my meaning.

Of course, there are lots of men who read their technical papers away from office when they are free from the distractions of the day. It is at such times that the advertiser stands the best change of securing attention for his proposition. Now if you put in a cartoon which is really and truly funny, you may get the reader to laugh until his sides ache, but the point is, is he amused with the joke, or is he interested in the goods? After all, the idea back of the advertiser's mind is to interest the prospective buyer in what he has to sell, not to amuse him. The latter can be left to *Punch* and other papers catering for the reader's entertainment. Granted that the cartoon is looked at and appreciated, is there not a great danger that the richness of the jest will overshadow the message the advertiser wishes to convey and *drive home?* I think so. Surely, it is better to attract attention by more serious methods, and, having gained the reader's eye, and, shall we say, sympathies, endeavour to interest him in what we have for sale; our steam engine, dynamo, switchgear, fuses, or whatever it happens to be. Is not this a more logical, and far less risky way of proceeding?

Of the postcards, etc., to which Mr. Berry refers, I can offer no opinion as I have not seen them, but as I take it that most of this matter is sent through the post, and addressed to firms and individuals, it seems to me that these hardly come within the scope of the present discussion which, up to the present, has been confined to technical paper publicity.

Circularising in any form is quite different to Press advertising. Both are but links in the selling chain which connects the seller with the buyer. When the two are used with discrimination, and in conjunction, then are the best results obtained.

And now for a word with Mr. A. M. Turner. It is essential for the writer of technical advertisements to have an acquaintance with technical phraseology and the customs of the engineering trade. At the same time it is not a *sine qua non* for the advertising man to be a past expert in the goods or apparatus he is advertising. There is a vast difference between the commercial man who knows his subject and the technical expert in the works, or test room. As a rule, the latter men know infinitely more about their subject than the individuals who sell it.

The advertising expert designs his announcement with the object of creating a bias in the mind of the reader, or of getting him to put himself in touch with the advertiser. A maker of expensive plant, such as steam sets, or complete electrical equipment, would draft his advertisements with the object of increasing his reputation. Such a one could not expect to receive a big bunch of enquiries, for the simple reason that there are but few buyers in the market at any one time for apparatus such as I have mentioned. Orders are not placed every day for plant or equipment which may run into several thousands of pounds. On the other hand, the advertiser of wiring accessories, electric light fittings, and such like, would be well advised to frame his advertisements with the object of getting direct enquiries. And there are advertising service agents who are able to give this specialised service to engineers and other technical advertisers. The advertising trade is very much the same as any other. Some firms give good service, others ——. Many agents devote themselves to a speciality: motor-cars, patent medicines, foods, garments, etc. And it is the specialist who is able to give the best service because of his accumulated experience.

With apologies for the length of this epistle,

Ernest Ingram Hill.

London, S.W., *January 22nd*, 1915.

Contracts with Alien Enemies.

It may interest your commercial readers to know that the Chamber of Commerce have seriously taken in hand this question.

The legislation required would roughly cover the determination or suspension of executory contracts with an enemy by way of a written order by the Secretary of State or the Board of Trade. The portion of the contract which has already been performed, of course, would be unaffected. When the matter has duly gone through the Chamber of Commerce Parliamentary Committee, and the other necessary steps have been taken, the practical step will be a deputation to place before the Government the commercial view of this matter, when it is hoped the Attorney-General will, in accordance with his promise, give the matter immediate attention, and, one trusts, incorporate the same in the Bill for next session.

T. W. Cole.

London, S.W., *January 22nd*, 1915.

Garage Heating.

I should like to record my appreciation of the Editors' footnote to my correspondence published in your issue of Jan. 8th under the above heading, and also for the reply of your correspondent "P. 6817." I must confess it appears that I have somewhat over-estimated the risk existing with petrol vapour, but I always understood that petrol vapour under certain conditions in air formed a mixture ignitable at a very low temperature. The lamp arrangement suggested by your correspondent I have utilised myself for temporary conditions, but always felt that it was not a safe method, owing to ignition risks.

By "garage," I had in mind the usual single brickwork building with wooden doors, such as is usually adopted by private car-owners, and I fully appreciate that such buildings are somewhat expensive to keep heated owing to the bad heat insulating qualities of the roof and walls, and the generally bad fitting doors, etc.

I am afraid, even though every precaution were taken to felt the interior and protect against draughts, that it would be a somewhat expensive matter, even with current at 1d. per unit, to heat the whole garage sufficiently to prevent damage to the upholstery, etc., and that it would be difficult to compete with slow-combustion stoves or externally-heated hot-water apparatus.

I have received several makers' catalogues illustrating heaters which they claim to be satisfactory for "garage" heating, but it would appear that they have not been carefully designed for the sole purpose they are intended for, and seldom is provision made for earthing, which is surely necessary where 200 volts and above is only available, and this from a public supply.

I must apologise for taking up so much of your valuable space, but I am confident it is a subject that interests a good many, and reliable data and information must be useful to others besides—

Interested Inquirer.

Salaries of Junior Engineers.

Having read the remarkable effusion by "Experienced" in last week's ELECTRICAL REVIEW, I am filled with mingled feelings of amusement and disgust. It is quite apparent to the average shift engineer that the writer cannot be experienced in the working of a public supply station with a capacity exceeding 100-KW.

He states in his letter that the station superintendent and his assistants are responsible for the efficient working of the station. Now what I would like to ask "Experienced" is: Who are the station superintendent's assistants but the shift

engineers? Of course, by that statement he absolutely gives himself away.

As for his remarks re card playing, if he had ever had charge of a shift in a modern power station he would know that frequently, if he managed to find time to eat a meal in comfort during his shift, he would be lucky, especially during the winter months.

The letter is quite clearly absurd to those acquainted with modern station practice. I have only troubled to answer it for the benefit of those not so acquainted who might form mistaken ideas as to the true value of the long-suffering shift engineer.

One of Them.

Judging from his remarks relating to the duties of shift engineers and others in a modern generating station, your correspondent "Experienced" has apparently forgotten the prefix "In" to his *nom de plume*.

Why confine the recreations of the shift engineer and switchboard attendant to card-playing? Surely the introduction of a piano in the engine-room, with a few comic songs by the switchboard attendant accompanied by the shift engineer, would relieve the monotony of "nap" and "cribbage," whilst a gramophone in the boiler-house would be a welcome addition to all the other automatic plant, including mechanical stokers, which require so little (?) attention.

It would perhaps be advisable to remind "Experienced" that a station equipped with the most recent automatic and labour-saving devices requires most careful and skilful operation, and any really good station superintendent will admit that he places far more confidence in the skill and intelligence of his staff than in all the automatic gear in the works.

The remarks of "Experienced" on this subject are far too facetious to be taken seriously, and the remainder of his letter appears to consist of a rather personal attack on Mr. Ebben, who—whatever his views upon the subject under the above heading—is not afraid to append his right name to his correspondence.

A few years spent in the running of a well-equipped electricity works would probably induce "Experienced" to modify his views, and he would then be in a better position to choose what appears at present a most unsuitable pseudonym.

W. E. Plowman.

London, *January 23rd*, 1915.

Referring to your correspondence column of the 22nd inst. regarding salaries of junior engineers, your reader who signs himself "Experienced" appears to be very rude. Some of his remarks, however, should not be allowed to go unchallenged.

Take the gist of his statement, that very little skill is required by shift engineers, switchboard attendants, and others to run central station plant. I think this remark is most ridiculous and unworthy of the publicity of your valuable columns. He states also in language very annoying to all station men, that it is chiefly by "rule of thumb" methods that the running of station plant is conducted.

Perhaps he could instance the rule of thumb methods of procedure for the following:—A fracture on a "live" steam main, a hot bearing, or an "earth" on the field circuit of a loaded alternator?

I could enumerate many like instances where that method would be a failure, also, I am as well assured that he would never take the responsibility of his "steady, experienced driver" in these cases, as I am assured that Mr. Ebben is no Hyde Park orator.

And, speaking of Mr. Ebben, whom I have the pleasure of knowing personally, I can inform "Experienced" that Mr. Ebben is one of the best of good fellows and knows very well how to treat cheap abuse, which I consider the other remarks made by "Experienced" are.

The A.E.S.E. has now a very large membership, mainly due, I think, to the untiring efforts of Mr. Ebben, who must get through an immense amount of work, and this, mark you, as an honorary secretary.

Wm. Cooper.

London, W., *January 23rd*, 1915.

Your correspondent under the doubtful *nom de plume* of "Experienced" is undoubtedly one of the engineer managers referred to in the very excellent letter of Mr. W. J. Ebben which you published in your columns a week or two ago. Of course, it is not for me to guess as to whether "Experienced" in his young days was one of those "with brains and liked work," and so obtained his promotion, or whether he had capital and influential friends behind him to boost him up, but the fact remains obvious that "Experienced" has much to learn respecting the running of electricity stations.

His statement in comparing the abilities of the engineer-in-charge and the engine-driver is more than sufficient to condemn his own capability to write letters on such a subject. The engine-drivers of my experience hardly know the difference between the dynamo and the switchboard, so that far from practically taking charge in time of trouble, they are more in need of someone to take charge of them. The majority of drivers are nothing more than stokers who have "had brains and who liked work," and have been promoted to the rank of driver. I should very much like to know exactly what can be learnt in the way of dealing with short-circuits, earths, and break-downs, etc., from the boiler-house. "Experienced" had also something to say about the "collar and cuff" engineer's amusements to while away his shift. Charge-engineers of my experience have more than sufficient to do in the way of work to occupy the whole of their time, and at the same time have to take the full responsibility of whatever occurs. It is absurd for your correspondent to state that the "collar and cuff gentleman" takes orders from the driver, more especially in such a case as a fault, either electrical or mechanical; indeed, it is extremely doubtful whether the average station superintendent or engineer-manager could get things in order without "the collar and cuff gentleman," considering that they just casually stroll around during the day it is not expected that they could do otherwise. Moreover, the college-trained man is in close touch with everything in boiler-house, engine-room and on switchboard, and knows exactly where and how things are, and also how they ought to be.

"Experienced" also states that owing to "rule of thumb" methods very little skill is required by shift-engineers, switchboard attendants and others as the regulating is "done by automatic apparatus." If your correspondent's experience has taken him so far as automatic gears he will know that they are far more complicated than the hand regulation methods, whether electrical or mechanical. Can "Experienced" tell us what part the "steady driver" would play in the event of this automatic gear going wrong? And as for the station superintendent and his assistants maintaining and taking the responsibility for the efficiency of this part of the works, I quite fail to see how he can do so if the mishap occurs when he isn't about, and where his responsibility lies. I suppose the "collar and cuff gentleman" awaits his coming before doing anything in the matter. In conclusion, I must say that in my opinion it is such men as "Experienced" who are the stumbling block of many smart juniors "with brains," but without the money and influential friends to find them good positions.

Collar and Cuffs.

I have been requested by the Bradford Branch of the A.E.S.E. to forward the following for insertion in your correspondence columns:—

W. J. Ebben, *Hon. General Secretary, A.E.S.E.*

London, N.E., *January 25th*, 1915.

If "Experienced" will kindly read his ELECTRICAL REVIEW for January 15th again, he will see that Mr. Ebben did not write the letter he objects to. Mr. Ebben was asked to forward the opinions of the Yorkshire members of the A.E.S.E., of which the Bradford Branch is the centre, to the Press, and he did so.

The facts and opinions as published are not grievances of the aforesaid members, but were put forward to draw attention to the "Situations Vacant" column of January 8th. Will "Experienced" kindly look out that number and deny the truth of the statements made on January 15th, if he can?

He admits that a few shift engineers and others are badly paid; that is not as it should be, but to say that those with brains who like work will undoubtedly get promotion makes one wonder how he obtained his present berth, and makes one sorry for those unfortunates who occupy subordinate positions under him and have to exist on less than an unskilled labourer's wages.

Further along he tells us that "rule of thumb" methods and very little skill are required by station engineers, etc., etc. Will "Experienced" kindly tell us who are the station superintendent's assistants, and if the shift engineers and switchboard attendants are not usually hoping to hold that exalted position some time in the future?

We thought "rule of thumb" methods had passed away with the Victorian Era; and that all the best practical and scientific means were adopted to obtain the most efficient and economical plant to fill our modern power stations. We think "Experienced" has not read his ELECTRICAL REVIEW week by week, or he would know better.

Will he tell us why one-third of the station engineers should be compelled to work for less than a labourer's wage when it usually costs the former rather more for house rent, food, etc., for himself, his wife and family than it costs the labourer?

Take the staff in a 25,000-KW. capacity station we know of, as follows:—One station superintendent, one assistant superintendent, five shift engineers, and 25 switchboard attendants of various grades. How many years will it be before a switchboard attendant of the middle grade reaches the post of station superintendent, and what will become of the other twenty-four?

If "Experienced" can solve that problem he will find a very good argument to work upon when next he takes up his pen.

It is an undoubted fact that we cannot all be station supers. or managers or foremen, but that is no reason why the younger should be badly paid.

"Experienced" gives himself away altogether; he is not an engineer, his "rule of thumb" proves that; and then he shows he is not a Trade Unionist, and we very much doubt if he has ever heard a "Hyde Park orator." He is an interesting study, and his letter will not keep the A.E.S.E. members who are well paid from trying to lift up those who are not so fortunate.

I have read with regret your "Experienced" correspondent's abuse of Mr. Ebben and the A.E.S.E. I am not a member of the A.E.S.E., neither do I know Mr. Ebben, but I have followed his good work and observed its progress since its inception. I hope the organisation will continue on its successful way. There are many questions to be considered before one can ascertain the cause of bad working conditions in central stations. They are generally caused by an inexperienced man being placed in authority, by a weak chief, who is easily overcome by a plausible tongue, yet strong enough by surrounding influence to retain his position. One never hears of bad feeling in a well-disciplined station, and the working conditions are always better.

Chief engineers should thoroughly examine their candidates before engaging them, because testimonials are not to be relied on. I have known of men writing their own, signed by the chief, at his request. I have also known of time-expired apprentices receiving testimonials which would do credit to chief assistants, just to get rid of them.

The system of working apprentices and other boy labour on shift work is an abominable system, and yet it is practised by a few of the smaller municipalities—under the nose of the Factory Inspector. Of course, it brings the working costs down to a minimum when there is an experienced man to superintend their working. In some such stations, boys fresh from school are put to work the board and even drive the engine and fire the boilers, and this in stations up to 1,500-KW. capacity. These apprentices blossom forth as electrical engineers, when, as a matter of fact, they are merely qualified to drive an engine or look after a switchboard. And yet this is the type of man we see pushed into supply stations to superintend others at a low wage, which he can increase by the pernicious method of using oil to his superior. The apprentice system requires rooting out. We can never get rid of the "swelled head," "something-out-of-nothing" variety of engineer who holds the reins and glories in being glorified, but by united action we might make things more comfortable.

Anti-Oil.

I am pleased to see that the question of the salaries of junior engineers has cropped up again, and that it is being regarded as a question on its own, apart from any other. I have been disappointed that ere now someone with an able pen has not thanked Sir John Snell for his remark on the subject, which remark really set the ball rolling. Mr. Ebben made a passing reference in his letter, but I think a straight "Thank you, Sir John," would have been more fitting, and was due.

I would like to draw attention to the first six lines in the second paragraph of the letter of "Experienced." He, in a letter which seems to indicate a man somewhat tyrannous, admits there are badly-paid men, in a FEW cases. I would suggest that he is referring to his own particular area, and think that elsewhere he would find another "few," and yet others. He points out that the smarter of these are qualifying for better positions. They are certainly trying to do so; but brains need books and little experimental ventures, too, to develop them, things which cost money, even if the books be second-hand. The money cannot be squeezed out of 30s. a week, and we have not all got fathers with long pockets to find it for us.

He further says that station work is now largely a "rule of thumb" affair, everything being done automatically. Does he realise that each piece of automatic apparatus in a place means something else for the man-in-charge to understand, to watch, and to keep in order? Further, if that automatic, whatever it may be, fails to perform its allotted function, the "mere man" must step in and use his knowledge. *He must know what to do under the circumstances, every bit as well as if no automatic means of doing it were installed.*

Automatic appliances do not relieve a man one whit of his responsibility. Whatever happens, he has to answer for it, even if it be a mistake on the part of his junior, as instanced by J. Kay.

There are many things, trivial perhaps in themselves, but which, taken together, point to a lack of consideration being shown to the men, on whom, perhaps above all others, depends the continuity of supply. Especially so when it is remembered they are at it seven days a week, fifty weeks per year, including all Bank and special holidays. I wonder whether managers recollect such times. Perhaps they were more fortunate.

I fear I mustn't trespass further on your space just now. I should like to see letters from other men who know what they say, and abstain from any inclination towards abuse or ridicule, which seem to me to be against our interests, even if indulged in by writers on the other side.

A Senior Assistant.

A.C. v. D.C. for Lighting.

In my opinion as a practical electrician who has installed and handled both alternate and direct lighting jobs, chiefly in factories and works where the conditions were anything but favourable, owing to heavy vibration, dampness or excessive heat, and often in very close positions, I have no hesitation in recommending direct current at about 240 to 250 volts in preference to alternating at 110 volts or any other pressure.

The chief trouble with the A.C. supply is that you have always two live wires to contend with at the point of entry into a room, the fixing of the usual single-pole tumbler switch to control a light or number of lights always leaves one terminal of the lamp-holder fully alive. In the case of a tubing job, where perhaps tube-end lamp-holders and bracket fittings are oftener used than pendant drops, the replacing of a lamp-holder means that several more branch circuits must be cut off to enable the repair to be carried out with safety after drawing the necessary fuses.

Also, the lower voltage would exactly double the cost of installation, as it becomes necessary to double the size of cable if the voltage is reduced by one-half. The increased fragility of the 250 or 240-volt lamp as compared with the 110-volt is all bunkum; any metal filament lamp will give out if roughly handled. I have found no difference whatever between the 240 and the 110-volt lamp. In fact, in my opinion the more universally used 230 to 250-volt lamp is the best lamp, and will last longer and stand more vibration and knocking about than the 110-volt lamp. In any case, it must be remembered that lamps are manufactured specially for very vibratory positions or traction work; these lamps are known as traction lamps. The 230 to 250-volt direct-current supply has become so universal that lamp manufacturers have devoted particular attention to the manufacture of lamps of both carbon and metallic filaments for this popular pressure.

One other little point must not be overlooked, for it is very often met with, and that is, that you cannot charge accumulators from an A.C. supply without installing an expensive apparatus known as an interrupter, or by using a motor generator. A.C. supply is also useless for electroplating and electrochemical or medical purposes. A single-pole switch only is necessary when placed on the live side of a D.C. circuit to render the circuit quite dead and harmless, and this practice is universally adopted for factory and works lighting.

Henry Fowler,
Electrician-in-Charge.

Liverpool, *January 23rd*, 1915.

[If the voltage is halved, the section of copper must be quadrupled, for the same load and percentage drop.—EDS. ELEC. REV.]

Commercial Relations with Germany.

At the conference of this Association, held in Edinburgh in 1911, we were favoured with the presence of the representatives of many Foreign and Colonial Commercial Travellers' Associations, including the powerful organisation in Germany. To mark the occasion the honorary membership of this Association was conferred on each oversea delegate present.

I have received through the post a copy of an announcement recently published in *Die Post*, the organ of the German Association, a translation of which I enclose herewith.

I think this document most interesting, showing, as it does, the ignorance of the real position amongst a class of the German people who should be acquainted, if anyone outside the ruling class is acquainted, with the real facts regarding the present deplorable strife and Britain's action and part therein, and showing the intense bitterness of feeling against this country of the commercial community in Germany.

I shall be glad if you will give publicity to this pronouncement, so that your readers may have first-hand evidence of the real mind of commercial Germany with regard to Britain. Confident as we are in the justice and right of the action we have taken, we can regard such action with the contempt it deserves, and it will be as well in future to be on our guard against resuming the business relations which have hitherto subsisted and to give to all things German, including her commercial travellers, a very wide berth.

Fred. Coysh,
Secretary, U.K. Commercial Travellers' Association.

London, W.C., *January 19th*, 1915.

NOTICE.

The undersigned have decided to resign our hon. membership of the United Kingdom Commercial Travellers' Association and to return our official badges at the first opportunity. The reason that this has not been done before is that the undersigned had the opinion that after the declaration of peace commercial relations between Germany and Great Britain would be resumed, and it would thus be out of place to break off good relations with old colleagues, but the action of England against Germany in business matters has reached such a degree of hatred and low action as has never before been known under any conditions of warfare amongst cultured nations; it is evident that the idea is not only to destroy German commerce but the German nation entirely. Further, the robbing of German property and the bad treatment of German prisoners in England, show England to be on such a low grade of civilisation that it will be many years before friendly relations can be resumed. It is therefore beneath our dignity and honour to wear an English badge.

(Signed) GEORGE HAASE, *Chairman Central Board.*
W. BAUER, *Vice-Chairman Central Board.*
FELIX EBEL, *Chairman Berlin Section.*
LUDWIG ULLMANN.
A. H. I. IOKA.
EMIL BERSTORFF.

War on German Trade.

We hear a good deal on the above subject, but one side that has not been given great prominence is the question of the employment of Britishers lately connected with German firms.

Some few weeks ago a firm advertised in your columns for an engineer for the sale of cable, and added this significant sentence: "Those previously employed by German firms need not apply." I ask, is this fair? To my mind it is most unjust.

In support of my view of the matter I would point out:—

1. If all firms acted in this way, then the Britisher who for patriotic reasons desired to join a British firm would be "kept at bay," and after the war would be more or less driven to rejoin the old firm.

2. If British manufacturers will only take into their employ men previously employed by German concerns and give them salaries which will induce them to stay, the war on German trade will be considerably furthered.

3. Face the facts! German organisation has always been excellent, and largely responsible for their extensive trade. Britishers employed by German firms have a knowledge of these methods, and could undoubtedly in many cases introduce them to great advantage into some of our firms and further strengthen our position in the future.

I speak from experience obtained in the employ of leading British and German firms, but as my views are evidently not shared by the firm who inserted the advertisement referred to above, I shall be very interested to know their reason for so wording the advertisement.

Britisher.

German Trade with Belgium.

After a stay of three months in England, I find that of the various points touched upon by the Belgian Press, in connection with the banishment of German products, one of the most important has been overlooked. I refer to electrical machinery and apparatus. As this especially concerns the readers of your esteemed REVIEW, and affects their interests only, you will oblige me by according to these lines the hospitality of your journal.

As many journalists and men of standing and justice have already pointed out, when we have driven from our devastated Belgium the usurping and criminal power, it will be our task to restore our country to a position at least as important as it occupied before the war, whilst casting out goods made in Germany or in other countries under the auspices of German capitalists. It goes without saying that this will not be accomplished without a struggle, especially in the latter connection, in view of the duplicity of which that country is a past master.

Two important points, however, will ensure to us this commercial victory, which, in my opinion, is no more uncertain than that of our allied armies on the vast field of battle:—

1. Belgian patriotism, mingled with hatred for the criminals.

2. The assistance that our English friends will continue to accord to us.

None of your readers, makers of electrical material, is unaware, I suppose, that Germany predominates in the export of this material to all countries. This is the case with regard to Belgium, thanks to low prices, in accordance moreover with the quality of the goods, as is well enough known, and to a system which has been widely adopted for the past fifteen years.

Now, having taken a firm resolve to banish this material from our country, how shall we accomplish it, seeing that a first necessity will be to re-establish installations in many industries at present ruined, to restore networks, and to replace gas undertakings with the latter, if the rival products are not known there or are inadequately appreciated?

I repeat that British aid will be a great asset towards victory, provided it takes shape in good time and with the necessary energy. Let your industrial leaders immediately issue an appeal to the many Belgian electricians and manufacturers at present in London, in order that in proportion as Belgium is freed your products may be brought within their reach under the most advantageous conditions.

As much in this relation as in that which concerns the system employed by Germany for the past 15 or 20 years, I place myself at the disposal of your readers, to smoothe the way that they would wish to follow.

As regards Belgian patriotism, I shall not dwell at length on this point; first, because, through modesty, I do not wish to magnify the wreath of glory won by our people at this time; and, secondly, because this quality has been proved ever since the commencement of the war.

Just as our brave soldiers, then, have been able to hold in check the first fierce onset of the German horde, so our commercial world, conscious of its duty and filled with gratitude, will be able to defeat the rapacity of the German capitalists and show them, with a gesture of defiance, that their fine but deceitful words will in future have to seek other fields.

I entrust you, Sirs, with my London address, at the disposal of your readers, with compliments and thanks in anticipation.

Jos. Barrea.

London, N.W. *January 23rd*, 1915.

[Several letters are held over.—EDS. ELEC. REV.]

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

E.A.C. Inching Starter.

THE ELECTRICAL APPARATUS CO., LTD., of Vauxhall Works, South Lambeth Road, S.W., have placed on the market a heavy duty D.C. inching starter, which we illustrate in fig. 1. It consists of an automatic circuit-breaker (contactor), interconnected with an otherwise plain rheostat in such a way that the circuit is always broken by the contactor, no matter how carelessly the starter is handled.

There is no hold-on coil or spring return, and by dispensing with the latter it has been possible to increase the brush pressure to give satisfactory contact and to obtain finer resistance graduation with more steps.

The rheostat movement consists of a plain lever with a superposed separate operating handle, the forward movement of which

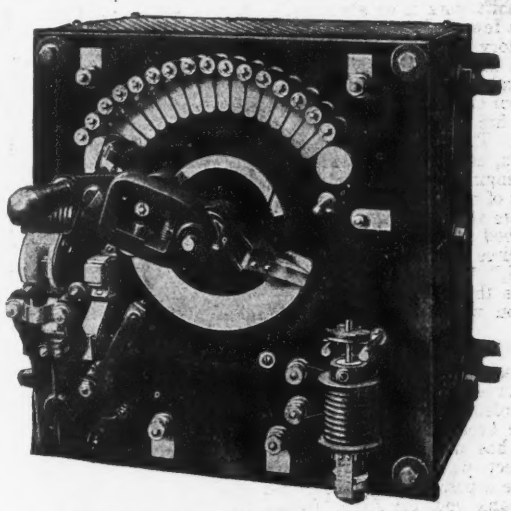


FIG. 1.—HEAVY DUTY INCHING STARTER.

latter, relatively to the lever, makes a plunger contact, energising the contactor coil and causing the contactor to close the main circuit to the motor.

If the handle is released or drawn back, the energising circuit to the contactor is broken and the contactor opens, stopping the motor.

When all the resistance is cut out, the handle can be released, as an alternative circuit to the contactor is provided in that position.

It should be noted that the contactor opens the circuit before the rheostat lever can be moved, and that a breaking arc on the starting segments is impossible.

The contactor can only pull up when the main lever is on the first contact, with all starting resistance in circuit; by automatically cutting in economy resistance with the closing of the contactor, the operating coil is only subjected to full voltage for a fraction of a second, and cannot be burnt out; also the inductive spark is broken by a properly-designed switch.

These inching starters are made in sizes from 5 H.P. to 200 H.P., and in the open, totally enclosed and back-of-board types.

An Electrically-Driven Rolling Mill.

A large firm of Birmingham steel workers recently decided to lay down a new 10-in. mill for rolling steel ingots down to various

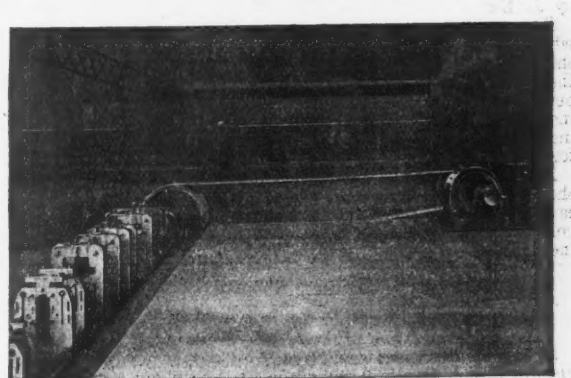


FIG. 2.—ROLLING MILL WITH 350-H.P. WITTON MOTOR DRIVE.

small sections, such as bicycle rims, &c. In fig. 2 will be seen a general view of the rolling mill, together with the driving motor,

The motor is rated at 350 H.P., and is of the "Witton" three-phase induction slip-ring type, and is started through a G.E.C. dust-tight liquid starter. Power for driving the motor, supplied by the Birmingham Corporation at 5,500 volts, three-phase, passes to a G.E.C. mistake-proof, boiler-plate motor-control panel. In addition to the usual gear this panel contains a set of choking coils to protect the end turns of the induction motor at the instant of switching on.

The drive from the motor is by cotton ropes on to a 7-ton fly-wheel carried on a shaft running in self-oiling dust-proof bearings. A special feature of the installation is that provision is made fo

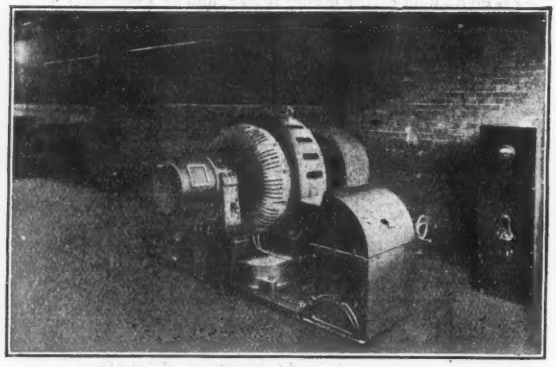


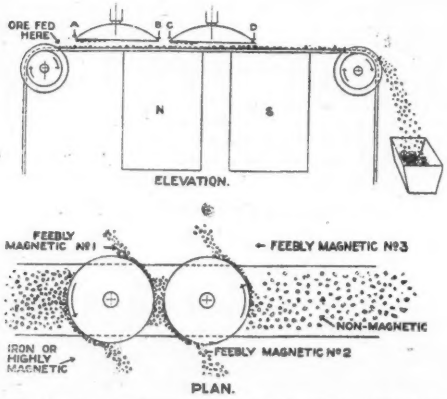
FIG. 3.—WITTON MOTOR WITH STARTER AND CONTROL PANEL.

the easy adjustment of every part which can possibly require it and everything is done to facilitate the changing of the rolls when this is required. The mill was built by Thos. Perry & Sons, Ltd., of Bilston, and the whole of the electrical equipment was supplied by the GENERAL ELECTRIC CO., LTD., of Witton. The views were taken at a time when the motor was not housed in.

New Magnetic Separator.

THE RAPID MAGNETTING MACHINE CO., LTD., of 18, Crescent, Birmingham, are introducing a new revolving disk magnetic separator (Type O), patents for which are pending, for the separation of feebly-magnetic ores.

It consists of a travelling feed belt passing successively over the poles of two vertical magnets. Two horizontal revolving domed iron disks are suspended over the belt, one somewhat in advance of the first pole and the other between the pole axes, as in figs. 4 & 5. The rim of the first disk is magnetised sufficiently to attract iron and highly-magnetic material from the ore on the belt, and the



FIGS. 4 & 5.—REVOLVING DISK MAGNETIC SEPARATOR.

disk being of sufficiently large diameter to overhang the edges of the belt, as it revolves carries the ore beyond the magnetic influence, when it falls off by gravity and is there collected.

A similar action occurs with the second revolving disk, which, however, is so situated that an intense magnetic field is produced in its rim actually over the poles, thus attracting the feebly-magnetic material which is deposited from the overhanging edge.

By the introduction of extra pole-pieces in tandem with disks of suitable construction, the number of magnetic products can be increased, and by suitable arrangement two distinct products can be obtained from each disk.

The machine is provided with a number of adjustments as regard speeds, spacings, magnetic strength and ore feed, which make for greater efficiency. By setting the disks so that the edges are at graduated distances from the ore, the magnetic field can be varied to give four magnetic products.

"Ediswan" Half-watt Lamp Fittings.

THE EDISON & SWAN UNITED ELECTRIC LIGHT CO., LTD., of Ponder's End, Middlesex, have placed on the market two similar half-watt lamp fittings, one of which is shown in fig 6. These are both made in cast-iron, and are suitable alike for interior or exterior use.

FIG. 6.—"EDISWAN" HALF-WATT LAMP FITTING.

In each case there are two sizes, one accomodating standard 100, 200 or 300-watt bulbs, and the other standard 500, 750 or 1,000-watt bulbs.

A simple form of adjustment to allow for varying length of bulb is provided; the fittings are water-proof and efficiently ventilated; one is provided with a reflector as in fig. 6, the other is without the reflector.

Lektrik Ceiling Roses.

The possibilities of the ceiling rose are admirably illustrated in a new list issued by MESSRS. A. P. LUNDBERG & SONS, of Pioneer Electrical Works, 477-489, Liverpool Road, N., which is devoted

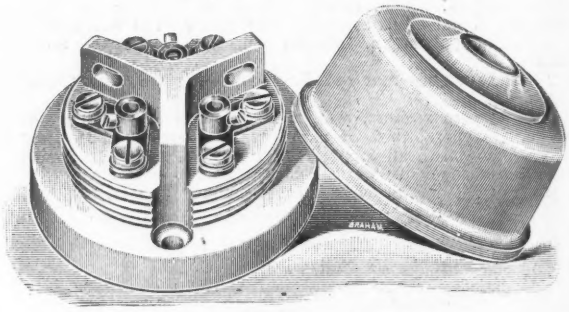


FIG. 7.—"TRIFLEX" ROSE.

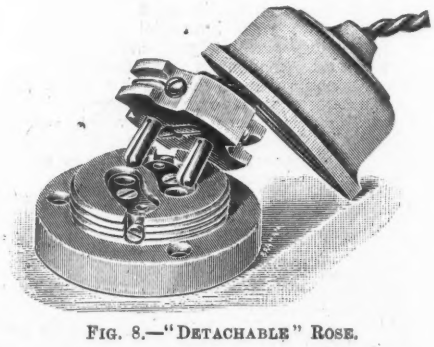


FIG. 8.—"DETACHABLE" ROSE.

entirely to these accessories. Six types are shown, ranging from the "Biflex," with two terminal plates, to the "Multiflex" with six, and plug-connection patterns. In fig. 7 we illustrate the "Triflex," in which each plate has a loop-in terminal and two screw and washer terminals. The shank of the centre terminal provides the means of fixing the plates to the porcelain base. The three plates provide for a variety of uses, amongst which may be

noted the connection of a switch to control the whole pendant, or to give three degrees of lighting with three lamps, or a series-parallel-and-off switch to give dim light or full light with two lamps, or an earthing wire.

Fig. 8 shows a device which enables the pendant fitting to be completely removed and replaced whenever desired without

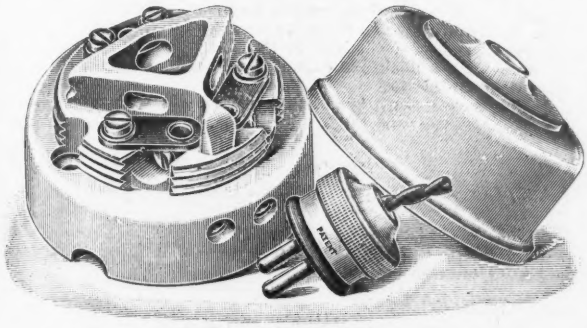


FIG. 9.—"M.I.P." ROSE AND PLUG CONNECTION.

detaching any screwed connections; and fig. 9 combines the advantages of a three-plate rose with a side plug connection for a small heater or motor, or other purposes—whence it is called the "Multum-in-Parvo."

Interlocking Switch Plug.

MESSRS. SIMPLEX CONDUITS, LTD., of 116, Charing Cross Road, W.C., have just introduced an interlocking switch plug mounted in a c.i. box for use on conduit installations. When the plug is inserted in the socket and the switch placed "on," the dolley lies

FIG. 10.—INTERLOCKING SWITCH PLUG.

over the extended flange of the plug, so that the latter cannot be withdrawn without switching off. It is also impossible to insert the plug with the switch on. We illustrate in fig. 10 a 5-ampere flush pattern switch plug, with plain polished brass cover.

Firing in the Dark.

A quick-sight electric flashlight rifle has been invented by a famous Australian explorer. The flashlight is fitted close to the muzzle of the firearm by a simple device, and the battery is carried in the butt. The light throws a T-shaped mark, which gives an automatic aim, the bullet striking practically at the intersection of the two lines. The device can be fitted to any arm, and should be useful to the big game shooter in the dark, or as a protection against thieves in the night. The flashlight can also be used for signalling.

Copper.—Returns for the half-month are now to hand, and we see from Messrs. H. R. Merton & Co.'s statistical circular that the total European visible supply is well maintained. Quantities at Havre are given as before the war, and the same course is followed with those at Hamburg and Bremen (if any). As these quantities remain fixed in the figures given, they do not affect the aspect of the increase or decrease, *i.e.*, the increase of 876 tons during the fortnight ending January 15th is a true increase at English ports, or afloat thereto.

Detailed supplies show a large quantity from Spain, equal to a month's supply previous to the war, as might have been expected after three months of short supplies from that country. Chile shipments are well over the average, Australian, so far, below it, but, from the quantity afloat, likely to exceed its pre-war average on the whole month's figures. Total deliveries are higher than half those of August, October, or November, but not up to the half of last month's. This may, of course, be considerably altered by antities received during the ensuing fortnight.

LEGAL.

TRAMCAR ACCIDENT CLAIM.

A VERDICT in favour of pursuer, with an award of £150 damages, was given in the Court of Session last Friday in a case in which a woman sued the Corporation of Glasgow for £250 damages for injuries she received on one of the Corporation cars. Pursuer stated that she was proceeding along the passage on top of the car when it stopped with a violent jerk. She was thrown forward and her head went through a glass panel. She attributed fault to defenders in respect that the car was being driven at an excessive rate of speed and was not under proper control. The Corporation denied fault, and stated that the driver brought the car to a standstill in order to avoid running over a dog. The car was going at a moderate speed, and, they said, was under proper control.

A SYDNEY CUSTOMS DUTY DISPUTE.

IN November, 1913, Ralph Sadlier Falkiner (trading as the Falkiner Electric Co.) imported a motor train, consisting of an engine, car, and 10 wagons. A dispute arose between the importer and the Customs Department as to the Customs classification for revenue purposes. The importer claimed that the duty should be £673, while the Customs Department claimed £4,590. Falkiner paid the duty claimed under protest, and claimed in a case heard before Mr. Justice Hood, a refund of £3,917, the difference between the duty collected and that which he held should have been paid.

MR. JUSTICE HOOD, in giving judgment at Melbourne in December, said plaintiff was entitled to judgment for the amount of duty paid in excess (about which, he understood, the parties would agree), and costs including discovery.—*Sydney Morning Herald.*

WORKMEN'S COMPENSATION CLAIM.

AT Wolverhampton County Court, on Monday, before his Honour Judge Howard Smith, and Dr. H. L. Brown (West Bromwich), who sat as Medical Assessor, Hannah Simcox, widow, applied for an arbitration under the Workmen's Compensation Act on behalf of herself and her three children, the sole dependants of her husband, Thomas Henry Simcox, who, it was alleged, was killed by an accident on the Wolverhampton tramways during his employment as a motorman by the Corporation. Applicant claimed £245.

The case for the applicant was that at 10.15 p.m., on November 18th, Simcox was driving a tramcar from Wolverhampton, in the direction of Willenhall. When near Hayward's works the car left the rails. Shortly afterwards a car from Willenhall came up, and by means of a cable power was transmitted to the derailed car. While this was in progress, Simcox took up his place on the front of the car. One attempt was unsuccessful, but at the second the lights on the derailed car came on. It was seen that Simcox had assumed a stooping position, and when it was realised that he had collapsed, the current was disconnected. Simcox was moaning, and after artificial respiration had been tried without success, he was taken to the General Hospital, where he was found to be dead. A post-mortem examination was made, and the conditions pointed to the fact that the man had been killed by shock.

DR. T. BLACK, formerly house surgeon at the General Hospital, said he made a post-mortem examination. He did not form any definite opinion as to the cause of death, but it was quite possible it resulted from the effect of an electric shock. He could not account for it in any other way. He discovered certain conditions which were present in cases of death from electric shock.

DR. BANKIER said he attended Simcox from October 30th to November 11th, the complaint being influenza and colic. There was no disease of the heart serious enough to cause death. Witness was present at the post-mortem examination. The dark and unclotted condition of the blood was a condition which he understood, pointed to electric shock.

For the defence, MR. HENRY LEA, of the firm of Lea & Son, consulting engineers, Birmingham, was called. He said that he tested the car after the accident, and if the insulation had not been perfect it might have caused shock. The insulation, however, was perfect.

DR. CHOLMELEY, who examined the body, said there was sufficient disease of the heart to cause death at any moment.

The JUDGE and DR. BROWN retired, and on returning the former said it was really a hopeless case on the applicant's part. He was advised by the medical assessor, and he agreed with him, that Simcox died as the result of the condition of the heart. Electric shock might have determined the cause, but Dr. Brown agreed with him that there was no evidence to show there was an electric shock at all. The verdict would be for the respondents, with costs.

MR. E. W. CAVE, barrister, pointed out that the Corporation had made an offer which, in his opinion, would have been handsome.

OSRAM LAMP WORKS, LTD. *v.* THE CORONA LAMP WORKS, LTD.

IN the Chancery Division, on Wednesday, January 27th, this cas was down for hearing before Mr. Justice Warrington

MR. A. J. WALTER, K.C., who, with Mr. Colefax, K.C., Mr. J. Hunter Gray and Mr. Lunge, represented the plaintiff company, informed his Lordship that the action had been settled. Judgment by consent would be taken with his Lordship's approval, the plaintiffs being granted an injunction as asked, and the defendants having paid £1,000 to cover damages and costs.

His LORDSHIP gave judgment in accordance with the terms of settlement.

BUSINESS NOTES.

Smoking Concert.—On Friday, January 22nd, the staff and foremen of the Edison & Swan United Electric Light Co., Ltd., held a smoking concert at the Staff Café, Ponder's End. Mr. J. W. Elliott presided, and Mr. J. S. Child occupied the vice-chair. Mr. Sydney Warwick acted as accompanist. We understand that Mr. C. F. Warren's vocal solos were greatly appreciated, and that the humorous songs of "Little Jack," the firm's telephone exchange operator, were equally enjoyed.

Pocket Lamp Inquiry.—Inquiry has been received for the names of United Kingdom manufacturers of cases and bulbs for electric pocket lamps, also for small polished steel reflectors. Communications should be addressed to the Secretary, British Chamber of Commerce, 9. Rue des Pyramides, Paris (Ref. G.W. 1,116).—*Board of Trade Journal.*

Trade Announcement.—MESSRS. FYFE, WILSON AND Co., of Glasgow, have opened a London office at Broad Sanctuary Chambers, 11, Tothill Street, Westminster, S.W., for the sale of their Kelvin petrol and paraffin engines and electric generating sets, "Quartowatt" heaters, &c. Mr. A. G. Tucker, who has been with the firm in Glasgow for a considerable time, will be in charge of the new office, and his telephone number will shortly be "6921 Victoria."

Liquidations.—THE ALTHEAT CO., LTD.—This company is winding up voluntarily, with Mr. A. Slatter, 62, Oxford Street, W., as liquidator. A meeting of creditors is called for February 1st.

THE UNIVERSAL RADIO SYNDICATE, LTD. — This company is winding up voluntarily, with Mr. F. A. Walrond, of 38 to 41, Queen Anne's Chambers, Westminster, S.W., as liquidator. A meeting of creditors is called for February 4th.

THE UITENHAGE ELECTRIC LIGHT & POWER CO.—A meeting will be held at 71A, Queen Victoria Street, E.C., on February 22nd, to hear an account of the winding up from the liquidator, Mr. E. West.

THE ELECTRICAL STORES, of Nottingham, write to point out that they have no connection with the Electrical Stores, Ltd., of Wolverhampton, which was referred to in our last issue. The former concern is a private partnership, not a limited company.

THE SANDWICH, DEAL AND WALMER ELECTRICITY SUPPLY CO., LTD.—A meeting will be held at 36, Castle Street, Dover, on February 27th, to hear an account of the winding up from the liquidator, Mr. R. Mowll.

BRITISH PROMETHEUS CO., LTD., Salop Street, Birmingham.—A Receiver for the debenture-holders has been appointed.

Book Notices.—Our valued contemporary *La Revue Electrique*, which published its issue for October 16th, 1914, on January 15th, states that it hopes to be able to appear regularly henceforth, and remarks on the distinct revival in scientific and industrial activity that coincided with the end of 1914. The contents consist of articles prepared for use in September, and include one by M. J. Blondin on telephotography and telephoty, in which recent apparatus are described. We welcome the return of the *Revue* to more normal conditions, and confidently hope that its career will never again be interrupted from such a cause.

"B.E.A.M.A. Journal." Vol. I, No. 1. January, 1915. London: The Association. Price 1s.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXIV, No. 1. January, 1915. New York: The Institute. Price 1$.

"Papers set in the Qualifying Examinations for the Mechanical Sciences Tripos, 1906-1913." Cambridge University Press. Price 2s. net.

"Annuaire pour l'an 1915 publié par le Bureau des Longitudes." Paris: Gauthier-Villars. Price 1 fr. 50 c.

"Graphical Determination of Sags and Stresses for Overhead Line Construction." By G. and M. Semenza. London: Hill Publishing Co. Price 12s. 6d. net.

"*Proceedings* of the South Wales Institute of Engineers." Vol. XXX, No. 6. Cardiff: The Institute. Price 5s.

"Electricity in Gases." By J. S. Townshend. Oxford: Clarendon Press. Price 14s. net.

"Lockwood's Builders and Contractors' Price Book, 1915." By F. T. W. Miller. London: Crosby Lockwood & Son. Price 4s.

German Cable Manufacturing.—A fresh development is in contemplation by the conversion into a joint stock company of the Norddeutsche Kabelwerke—an undertaking which was formed by the Mix & Genest Telephone Co. about four years ago, with a capital of £15,000. The share capital of the reconstituted company, which bears practically the same title, amounts to £75,000, of which the Municipal Council of Neukölln, where a new factory is in course of erection, is reported to have subscribed £15,000. It is proposed to extend the scope of the company's manufactures, including the production of rubber core cables, and when the factory is finished it will be possible to turn out all the manufactures of a modern cable works.

Catalogues Wanted for India.—MESSRS. GREAVES, COTTON & CO., who are opening a branch of their electrical department in Karachi, invite our firms to send catalogues addressed to them at Karachi, India.

Patent Application.—MR. L. BRENNAN, C.B., has applied for restoration of Patent No. 26,034 of 1909, for "Improvements in means for imparting stability to unstable bodies."

Bankruptcy Proceedings.—W. WALKER (D. Smith and Co.), dealer in electric lamps, 2 and 3, Red Lion Court, Fleet Street, E.C.—Last day for proofs for dividend February 6th. Mr. E. S. Grey, Official Receiver, trustee, Bankruptcy Buildings, W.C.

W. R. WEDGE, Albion Place, Northampton, lately carrying on business as electrical engineer in the Arcade, Northampton.—At the Northampton Bankruptcy Court, on Tuesday, the examination was adjourned *sine die*.

A. WHITELEY, electrical and mechanical engineer, Llandudno.—First meeting, February 5th, at Crypt Chambers, Chester. Public examination, May 4th, at Bangor.

Calendars and Diaries.—MESSRS. HAYWARD-TYLER AND CO., LTD., of 99, Queen Victoria Street, London, E.C., have sent us one of their usual pocket diaries for 1915. In addition to daily diary space there are some pages of engineering memoranda relating to water supply matters, and illustrated particulars of the firm's pumping machinery.

From the Hyatt roller-bearing department of MESSRS. BROOM AND WADE, LTD., High Wycombe, Bucks., we have received a scrap of card illustrating their bearings. When opened it turns out to contain a tiny calendar for 1915.

MESSRS. TOY & WINSLOW, of 58, Stockwell Road, Brixton, S.W., have sent us a desk calendar with monthly slips.

Catalogues and Lists.—MESSRS. LANDIS & GYR, LTD., Elgee Works, Stonebridge Park, Willesden, N.W.—Leaflet illustrating and giving connection diagrams of double tariff meters, with clock and hand control.

MESSRS. LACY-HULBERT & CO., LTD., 51, Victoria Street, Westminster, S.W.—Four new leaflets briefly describing, illustrating and giving prices of "Boreas" air compressors, electric air compressors, electric blowers and rotary blowers.

THE BENJAMIN ELECTRIC, LTD., 1A, Rosebery Avenue, London E.C.—Four new sectional publications in attractive and serviceable form. No. 500 gives particulars and prices of "Marbella" opal reflectors of the distributing and concentrating types; No. 501 (24 pp.) details numerous Benjamin lighting specialities, such as wireless clusters, Edison screw devices, lampholders, &c.; No. 503 (16 pp.) is devoted to a number of reflectors and fittings for shop window, show-case, and cornice lighting; No. 502 is a 40-page pamphlet entitled "Economical Industrial Lighting," and it gives full information concerning the Benjamin steel line of reflectors and reflector fittings designed for this class of illumination service. All of the publications are fully illustrated, and have the prices set out very clearly.

MESSRS. SIMPLEX CONDUITS, LTD., 116, Charing Cross Road, London, W.C.—16-page electric heating list containing illustrations and prices of a range of Plexsim luminous radiators, from one to six lights, Murray's patent radiators, the Plexsim electric heat projector, and various designs of convectors operating upon the Simplex strip system.

MESSRS. CROMPTON & CO., LTD., Chelmsford.—Leaflet describing their "D" pattern portable moving coil instruments, ammeters, voltmeters and combined volt-ammeters, and giving prices of same.

MESSRS. PASS & SEYMOUR, INC., Syracuse, U.S.A.—Price leaflet in three languages giving particulars of "Shurlock" electric sockets.

MESSRS. THOMAS MITCHELL & SONS, LTD., Derby Street, Bolton.—100-page catalogue of the stock of second-hand machinery, boilers, engines, electrical plant, &c., that they have available.

MESSRS. JULIUS SAX & CO., LTD., 24A, High Street, New Oxford Street, London, W.C.—16-page catalogue of electric bell and lighting accessories, Holophane glassware and fittings.

Norway.—The Tinfos Electrical Iron Works, which are the only exporters of electric pig-iron in Norway, have lately had a number of inquiries from abroad for the material, and, in fact, for more than the works are able to produce. To Danish motor manufactories and foundries the company has lately sold 1,700 tons of electric pig-iron, and 350 tons to other countries. The company has also practically secured an order for 500 tons for Italy.

Private Arrangements.—SPAGNOLETTI, LTD., electrical engineers, Goldhawk Road, Shepherd's Bush.—The creditors of the above were called together last week at the offices of the liquidator, when it was stated that the meeting had been held in pursuance of the provisions of the Companies' (Consolidation) Act, the shareholders having passed a resolution for the voluntary liquidation. The liquidator stated that the company was registered in August, 1907, with a capital of £20,000, there being no public issue. In October, 1907, there was a debenture to the extent of £10,500 issued, and a further issue of £2,000 general charge, including the freehold land and buildings at Goldhawk Road. Another debenture was issued in December, 1913, in favour of the London County and Westminster Bank. The real object of the company going into voluntary liquidation was to get rid of the present name of Spagnoletti and reconstruct the company. The sale of the whole of the assets had been concluded, and the business had been taken over by the Park Royal Engineering Works, Ltd., who would continue the business. The trade liabilities would be paid in full and the creditors would probably each receive a cheque in settlement before the end of the present month. No resolution was passed, and the voluntary liquidation will, therefore, remain in the hands of the present liquidator.

(*Continued on page* 149.)

THE EDISON & SWAN ELECTRIC LAMP WORKS.

Firms may come and firms may go—but few of us can remember when the Edison & Swan Co. came into existence, for from the earliest days of electric lighting the name of this firm has been a household word, and none of us is likely to see it go, if we may judge by its present activity; long may it flourish, and worthily may it continue to bear testimony to the splendid work accomplished by the two great pioneers whose names it proudly bears! Ill fortune has dogged the steps of many of the old firms which laid the foundations of the electrical industry, and not a few of them have succumbed to the assaults of competition or the canker of internal disorders; the "Ediswan" company itself has not escaped the trials of adversity, but it has survived all perils, and now, with undiminished energy and renewed vitality, it appears to have entered upon an era of prosperity unsurpassed in its previous career.

Mounting Carbon Filaments for "Ediswan" Lamps.

J. W. Swan and T. A. Edison, in this country were amalgamated, and the manufacture of incandescent electric lamps was commenced under their joint patents. During the reign of the carbon filament, the "Royal Ediswan" lamp acquired and maintained a reputation second to none, and the firm established branches in many provincial towns, as well as in the British Colonies and South America. On the introduction of the tungsten filament a few years ago, the firm took up the manufacture of the new type of lamp, first with the pressed or squirted filament, and later with the drawn-wire filament, and achieved equally satisfactory results.

It is a remarkable fact that, in spite of the high efficiency of the tungsten lamp, the demand for the carbon-filament lamp has suffered but little diminution, and consequently on a recent visit to the works at Ponder's End, we found the carbon lamp department busily employed, the output from this branch amounting nearly to half the total output of Ediswan lamps. The question has often been

Flashing and Checking Carbon Filaments.

Exhausting Tungsten Lamps.

Sealing Drawn-Wire and Carbon Lamps.

Photometer Room.

The firm was established in 1883, with a capital of one million sterling, when the interests of the two inventors,

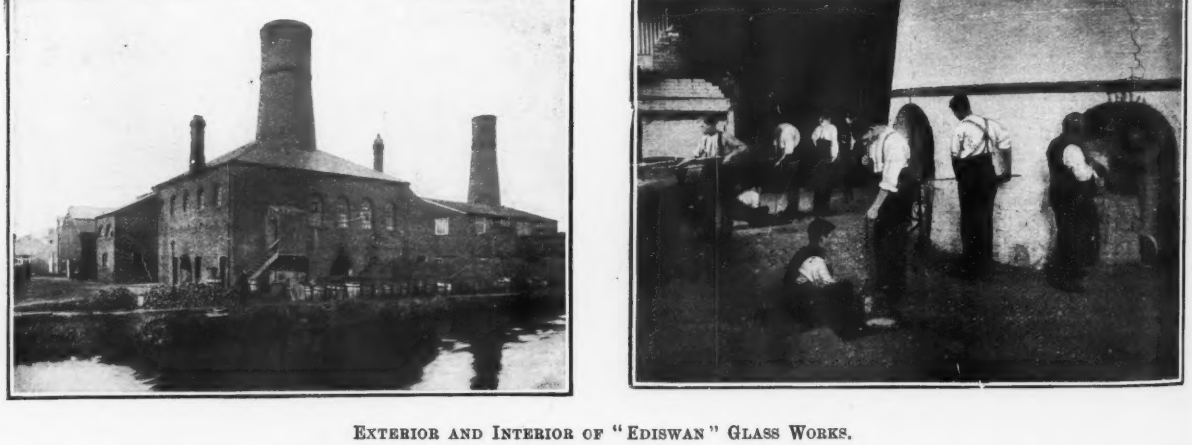
asked—who uses carbon lamps nowadays? The reply is that wherever lamps are exposed to rough usage, shocks, and vibration, the carbon lamp, which can be turned out at one-quarter the cost of the tungsten type, is still the most economical; the filaments are able to withstand an extraordinary amount of hard knocks, and the cost of renewals is comparatively trifling. Thus, carbon lamps are still employed on warships, at collieries, and on some railways, and for portable lanterns on ships, in workshops, &c.

The processes involved in the manufacture of incandescent lamps are now so familiar to our readers that we need not describe them in detail. In the Ediswan works we saw great quantities of cellulose filaments being squirted, hardened and dried, passed through dies to render them uniform in diameter, and carbonised; bearing in mind the length of filament in a lamp, and even allowing for a large percentage of waste, the amount of filament material prepared affords some idea of the enormous output of the works. The filaments are sorted, mounted and flashed in the customary way, and the construction of the lamps otherwise calls for no comment, but the production of the bulbs is a different matter, for the Ediswan works is unique in that it is provided with a glass-blowing department on the premises, in which the whole of the bulbs are manufactured. The company is fortunately situated in this respect, as the supplies of foreign bulbs used in this country were cut off on the outbreak of war. In addition to two large glass furnaces which have been in use for many years, a new and still larger one, with 12 pots, has recently been built and put in operation; the original small furnace with which the company commenced its glass-blowing operations—more than a quarter of a century ago—has also been brought into use again after a long period of idleness. The process of making a bulb is perhaps the most interesting of all the operations connected with lamp-making; yet it is exceedingly simple—to the spectator. The workman dips an iron tube into the pot of molten glass, which we believe is called "metal," and withdraws it with a glowing lump of plastic glass on the end; after blowing it out a little, swinging and spinning it, he inserts it between the halves of a mould which is quickly closed by a boy helper, and blows it out in the mould whilst rotating it, so that the joint of the mould leaves no mark on the bulb. The latter is withdrawn in a few seconds, ready for use. The workman displays remarkable skill and judgment in taking exactly the right quantity of glass and manipulating it so that the thickness of the walls is uniform. The largest bulbs for high-C.P. lamps are made in a similar manner, but the operation is longer and more difficult, requiring two heats.

Winding and Mounting Metal Filaments.

The whole of the process of glass-making is carried on in the works, from the raw materials—chiefly sand and red lead—of which an abundant supply is available; the output of bulbs, already numbering some millions per annum, will be greatly increased by the addition of the new large furnace, but we understand that the whole of it will be absorbed by the Edison and Swan works. The construction of the glass furnaces—which somewhat resemble pottery kilns in shape—and the mode of setting and heating the "pots" in which the glass is melted and refined, are exceptionally interesting features of the works; the pots, for which a special quality of fire-clay is used, are made and set by the expert staff of the company. The pots as well as the furnace have to be heated to a high temperature before the setting takes place, and the operations carried on under such arduous conditions make heavy demands upon the skill and endurance of the manager of the department and his assistants.

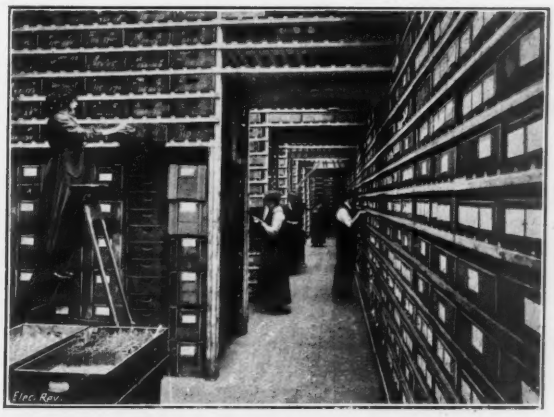
Returning to the lamp-making works, we watched with interest the drawing of tungsten wire through diamond dies to the smallest sizes, and the subsequent processes of shaping, winding and mounting the filaments, which follow the usual lines. Besides the ordinary standard lamps, a variety of special types are manufactured by the company, from the tiny lamps for telephone switchboards to lamps of the highest candle-power. Various improvements have been introduced by the staff, whose prolonged and unique experience must be of the greatest value to the company, many of the experts having been associated with the firm almost from the commencement of its operations. The lamps are tested at various stages of manufacture, and the



Exterior and Interior of "Ediswan" Glass Works.

photometer rooms are exceptionally well equipped, the pentane lamp being used as the ultimate standard of reference.

Even where the bulbs have been of British manufacture, it has been a common practice to import the vitrite and brass caps; this company, however, has made itself independent of foreign aid in this respect also, by installing machinery for the manufacture of the caps, so that every part of an Ediswan lamp is entirely British made. The



Finishing Department and Stock Room at "Ediswan" Works.

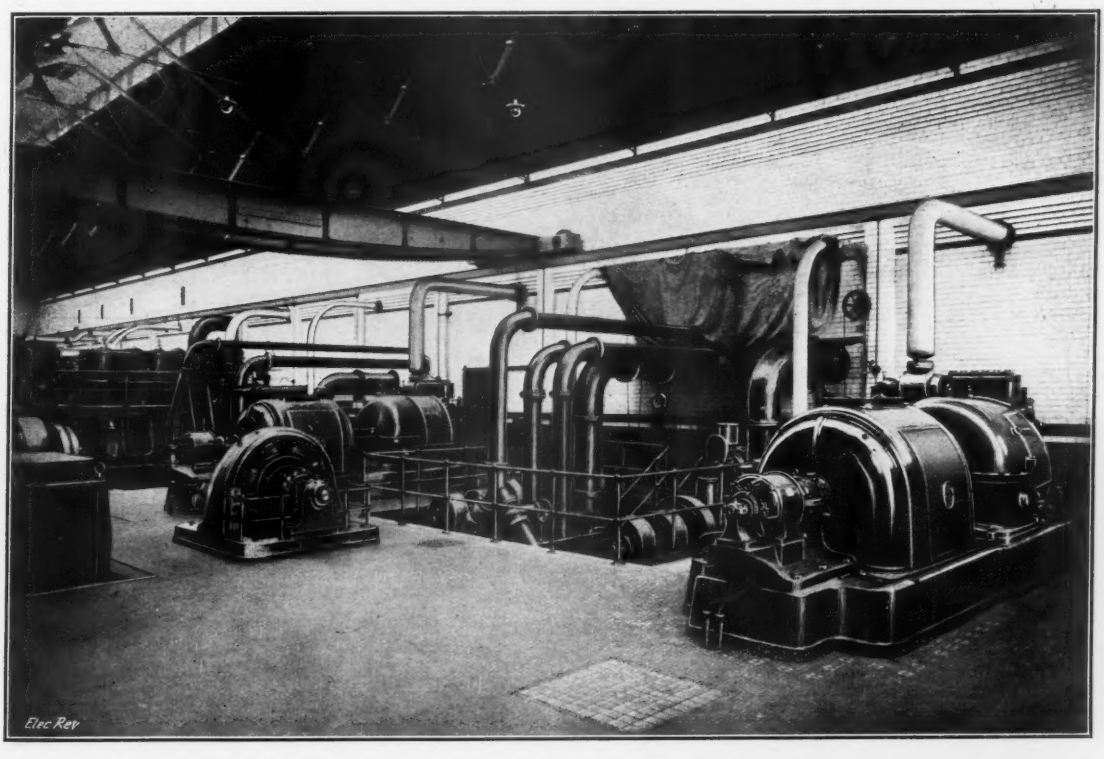
accompanying illustrations show some of the departments of the lamp works; but the company, in addition to lamps, makes a variety of instruments, switchgear, heating apparatus, &c., and its other departments are working at high pressure in the execution of important contracts. Owing to the needs of the Government, which have absorbed a large proportion of the company's products, the effect of the war has been not to reduce, but to redouble the activity of the works, and every effort has been and is being put forward to cope with the extraordinary demand for Ediswan manufactures; the buildings are being extended and additional machines installed for this purpose. The employés number about 2,500.

In expressing our thanks to the directors for the opportunity of visiting the works, and to the staff for the kindly courtesy with which we were shown the various processes, we add the hope that the present prosperity of the company may be maintained not only during the war, but also into the distant future.

THREE-PHASE PLANT AT ASHTON-UNDER-LYNE.

During the last few years electricity supply has made great headway in the industrial and manufacturing areas of this country. This is particularly true of the Lancashire cotton manufacturing districts, in which the demand for greater facilities in the matter of electric driving in mills and factories has led to a very general adoption of three-phase generation and distribution on the part of the municipal electricity suppliers in the vicinity of such works.

New three-phase power stations are springing up and others are projected, while the same type of plant is making its appearance, even in small areas where a power load is in prospect.



Interior of Ashton-under-Lyne Corporation Generating Station. New Three-phase Turbine Plant in Foreground.

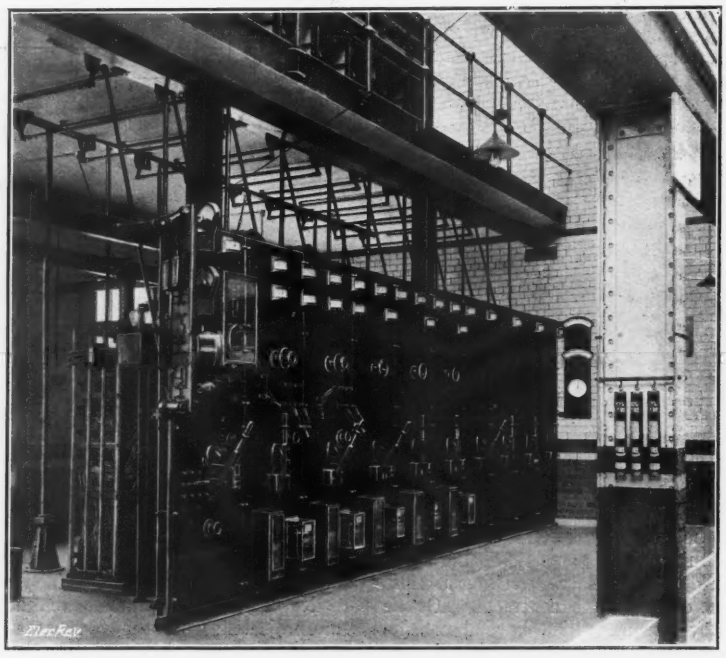
In many of the smaller industrial centres, the domestic lighting load, under present conditions, offers little scope for development, and the acquisition of a power load is the best means of placing the supply undertaking on a firm basis, and thereby improving the conditions of supply all round.

As an example of work carried out on these lines, we may refer to the recent developments in connection with the Ashton-under-Lyne Corporation electricity undertaking.

In 1910 when the question of extensions was being considered, it was decided to start a three-phase alternating-current supply, and for this purpose a Willans exhaust steam turbine coupled to a 400-KW. Peebles alternator, and a 400-KW. Peebles motor-alternator were installed.

The area up to that time had been supplied on the three-wire direct-current system and the Willans turbine operates on the exhaust steam from three Browett-Lindley direct-current sets, and in conjunction with an Allen counter-current jet condenser, with a capacity of 25,000 lb. of steam per hour. The condensing water is passed through a Blasberg cooling tower of 125,000 gallons per hour capacity.

The installation of this plant took all the available space in the then existing buildings, and, further plant being required, a large extension scheme was put in hand, and has been in use for some months.



THREE-PHASE H.T. CONTROL BOARD, ASHTON-UNDER-LYNE.

This comprised a boiler house to hold five 9-ft. diameter Lancashire boilers, with Goodbrand economisers and a chimney to deal with the gases from ten boilers; the boilers are equipped with Sugden superheaters and Triumph machine stokers, the hoppers of which are supplied with coal by small Bennis elevators—one to each boiler. The elevators are fed from a 1,000-ton coal bunker facing the boilers, and pass up over the firing floor to spouts leading to the stoker hoppers, this arrangement being similar to that adopted in the original boiler plant.

THREE-PHASE OIL SWITCH CUBICLES ON GALLERY.

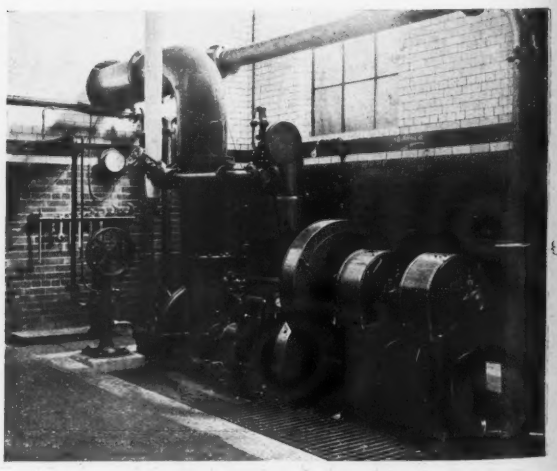
The coal elevating and conveying plant for filling the bunkers was supplied by Messrs. R. Dempster & Sons.

As there is no natural source of water on the site, all the water for condensing and boiler feed purposes is pumped from a borehole, some 500-600 ft. deep, being subsequently treated in a Kennicott water softener of 5,000 gallons per hour capacity, and passed to the cooling-tower plant. The feed water is drawn from the jet condenser discharge on its way to the cooling towers, and passed through a feed heater—into which the pump exhausts are turned—prior to passing through the economisers.

Two 6,000-gallon Nichols steam feed pumps form part of the new extension.

An addition was also made to the engine-room building, in which two 1,500-KW. B.T.H. three-stage Curtis turbines running at 3,000 R.P.M. on steam at 145-lb. pressure are installed, each driving a three-phase alternator for supplying 3,300-volt, 50-cycle current and a direct-coupled 16-KW. exciter. The cooling air for the alternators is passed through Balcke dry air filters in the basement.

The condensing plant is installed in an open well between the two turbine sets, each of which exhausts into an Allen counter-current jet condenser, the steam-driven pump set in connection with which consists of a 65-H.P. Allen tandem compound engine driving a centrifugal extraction pump and a geared two-throw air pump.



ONE OF THREE SIMILAR ALLEN CONDENSING PLANTS AT ASHTON-UNDER LYNE.

To economise space in the engine room, the condensers have been erected in the boiler house, into which the main exhaust pipes are led.

The condenser bodies are cylindrical in shape, of riveted steel, and provided with internal perforated steel trays to insure intimate mixing of the steam and water. Each condenser is supplied with a butterfly valve and float for

controlling the quantity of injection water and to safeguard against flooding of the condenser and turbine should the water extraction pump fail.

The air pumps are of the single-acting Allen-Edwards type, speed 150 R.P.M., driven through a cast-iron spur wheel and paper pinion on the engine shaft, which runs at 500 R.P.M. The centrifugal water extraction pumps are arranged to deliver over the top of cooling towers.

These condensing plants are similar to the earlier one provided for the exhaust turbine set, and will deal with 25,000 lb. steam per hour, giving a 27½-in. vacuum with condensing water at 80° F. The centrifugal pumps are each rated at 115,000 gallons per hour, and to meet the further requirements of this plant a Davenport cooling tower was installed, of similar size to that previously mentioned.

As an additional link between the alternating and direct-current plant, a 500-KW. Westinghouse six-phase rotary converter is installed, speed 750 R.P.M., together with a 550-KW. transformer, the whole of the three-phase plant being controlled by B.T.H. oil switchgear installed in a recess on one side of the engine room.

This H.T. switchgear consists of an operating board standing slightly above engine room floor level, with the oil switches, two sets of bus-bars, &c., in cubicles mounted on a gallery above. The oil switches are designed to break 10,000 KW. safely, and are mechanically operated. The operating board of the usual B.T.H. type includes panels for the three turbine sets and four feeders; an interconnector panel for the bus-bars fitted with a Tirril regulator; and panels for the motor-alternator and rotary converter.

Our views give a good idea of the new three-phase plant, and some indication of the original engine-room, with a modern 500-KW. Belliss direct-current set conspicuous in the background. Amongst the consumers on three-phase supply are cotton mills, rubber works, cake factories, a colliery, &c., which are supplied both by underground and overhead mains, the contracts for which have been carried out by the British Insulated & Helsby Cables, Ltd., and the Mackintosh Cable Co.

At the present time the three-phase load is increasing rapidly, as the following figures indicate :—

One week. December.	General supply.	Tramway supply.	Three-phase supply.	One week. Total.
1913	44,315	34,850	18,537	97,702
1914	44,698	32,329	83,478	160,505

As to the effect of the new plant on the operation of the station, it is worth noting that the coal consumption per unit delivered to the mains has fallen from 5½—6 lb. to 3·70 lb., the latter figure representing a cost of ·198d. per unit (with coal at about 10s. per ton); the generating costs as a whole are about ·43d. per unit.

The full load steam consumption of the new turbine sets on test was 16·3 lb. per unit, and erected on site under normal working conditions on two-thirds load, including steam range and auxiliary engine losses, amounted to 18·05 lb. per unit.

The extensions as a whole, buildings and plant, have cost some £37,000, equivalent to £10·1 per KW. of generating plant installed.

For the particulars and figures which we quote, we are indebted to Mr. Neville Appelbee, the electrical engineer to the Corporation, on whose advice the introduction of three-phase supply has been carried out.

That his anticipations have been amply realised, may be gathered from the fact that the growing demand on the station points to the necessity of installing another turbine set almost immediately, which will have a larger output than the existing ones, and will take the place of some of the earlier reciprocating plant.

In conclusion, our thanks are due to Mr. Appelbee for so readily assisting us in the preparation of this short article.

Fire.—A Reuter dispatch from Trenton, New Jersey, states that damage to the tune of £200,000 was done by a fire which broke out on January 19th at the plant of John A. Roebling, Sons & Co. The company was making insulated wire for telegraph and telephone field service and trace chains for artillery. Incendiarism is suspected.

BUSINESS NOTES.

(*Continued from page* 144.)

Catalogues Wanted in Spain.—Firms dealing in electric railway material and accessories for tramways, are invited to send catalogues and particulars of export prices to Mr. B. Abraldes, Carral No. 9—1°, Vigo, Spain.

For Sale.—Halifax Corporation Electricity Committee has for disposal by tender one 30 ft. by 9 ft. Lancashire boiler, with sprinkler stokers and superheater. Particulars are given in our advertisement pages to-day.

LIGHTING and POWER NOTES.

Aberdeen. — RESTRICTED LIGHTING. — The Lighting Committee of the T.C. reports that owing to the curtailment of the public lighting there was a saving of £968 on the electricity account up to the end of December. The total amount saved in both electricity and gas since August last amounted to £2,000.

Barnet.—INFIRMARY LIGHTING.—The B. of G. has considered the offer of the North Metropolitan Electric Power Co. to supply energy in bulk to the new infirmary, at 1d. per unit, with an additional fixed charge of £50 per annum, the company undertaking to lay cabling in duplicate, free of cost, and has finally decided to adhere to the original intention to supply its own energy. The question of an agreement for an emergency supply of current in case of necessity was referred to a committee.

Belleek.—E.L. SCHEME.—The Fermanagh C.C. has granted permission to the Belleek R.C. to erect the necessary poles for the proposed electric lighting of the town; the power will be supplied by the Belleek Pottery.

Blackpool.—A temporary failure of the electric light on January 20th was caused by the bursting of a water main, which had the effect of flooding an electric light chamber near the central station. The motor fire engine very speedily cleared away the water.

Boston.—PROV. ORDER.—The R.D.C., having been asked to consent to the application of the Boston and District Electric Supply Co. for a prov. order for E.L., has decided to see what is done in the matter by the Boston Corporation.

Bury.—OVERHEAD MAINS.—Application is to be made to the B. of T. for permission to erect an overhead electrical line for the purpose of a bulk supply to Heywood.

Chapel-en-le-Frith. — WORKHOUSE LIGHTING. — The B. of G. has decided to obtain an estimate for an E.L. installation at the workhouse.

Chertsey.—The R.D.C. has been informed that the B. of T. intends granting an order to the Woking Electricity Supply Co. Ltd., permitting it to supply electricity in bulk to the Ascot and District Electricity Supply Co. The Council has decided to inquire from the Woking Co. what its proposed charges for current are.

Chipstead.—The Surrey County Council is advised by the Parliamentary Committee that, for its own protection, it should have Clause 14 of the Electric Lighting (Clauses) Act, 1899, inserted in the Chipstead and District E.L. Prov. Order, applied for by Mr. G. Allom.

Cleethorpes.—PROPOSED LOAN.—The D.C. has decided to apply to the Public Works Loan Commissioners for a loan for electricity purposes as follows:—Mains, £7,870; services, £965; cut-outs, £148; switchboards, &c., £198; meters, £819.

Colwyn Bay.—PUBLIC LIGHTING.—The U.D.C. has decided to utilise high-power electric lamps instead of gas for lighting the portion of Abergele Road containing business premises, and the business part of Old Colwyn from Church Walks to the Ship Hotel.

Continental.—SPAIN. — A Royal Order, under date December 14th, authorises the Sociedad La Riverena, of Duero, to extend its distribution network, to include the towns of Aranza, Jumiel de Hizan, La Aguilera Vilalba, and other localities in the Spanish Province of Burgos. Similar authorisation is accorded to the Sociedad Anonima El Porvenir to the towns of Quintanilla, Sobresierra, Masa and Sedano, in the same province, through the medium of a sub-station to be erected.

The Sociedad Anonima Union Industria is the style of a company formed at Villanueva and Geltru, Spain, for the erection of works for the supply of gas and electricity.

A concession has been secured to supply electric light and power to the towns of Carino, Mera, San Claudio, Ortiquèira and Cedeira, in the Spanish Province of Coruna.

Crayford.—The P.C. has received amended terms for lighting by electricity from the West Kent Electric Co., which is supplying houses on the estate at Barnes Cray with current. The new terms have been referred to the Lighting Committee for consideration.

Coventry.—The Sub-Committee of the E.L. Committee, having inspected the dust-catching arrangement installed in connection with the dust destructor at Poplar, recommends that a similar arrangement be installed in connection with the forthcoming extensions at the electricity works.

The Electricity Committee has approved of the amended terms for the use of water from the Coventry Canal Co. for condensing purposes. The payment by the Corporation is to be £325 per annum for the present plant plus £20 per annum for each additional 3,000 KW. of plant installed. A Sub-Committee was appointed to consider as to the terms upon which electricity could be supplied to the workmen's cottages at Stoke in connection with the Leicester Street re-housing scheme.

Dover.—The T.C. has decided to have the drainage works lighted by electricity.

Durham.—SCHOOL LIGHTING.—The C.C. has decided to have the E.L. installed at the County Industrial Schools.

Earlstown (Lancs.).—E.L. SCHEME.—The D.C. has appointed Mr. E. M. Lacey consulting engineer in connection with the electric lighting scheme.

Edinburgh.—HIRING CLAUSES, &c.—The T.C., by 20 votes to 13, decided to delete clauses 66 and 67 in the Corporation's prov. order, which proposed to give power to let on hire electrical appliances and to open showrooms in the city for this purpose.

Epping.—The U.D.C. has decided to oppose the London Electricity Bill.

Grimsby.—PROPOSED LOANS.—The T.C. is recommended to apply to the L.G.B. for sanction to borrow £5,000 for a new battery, £4,000 for mains, and £2,000 for services.

India.—The Ahmedabad electricity generating station is now almost completed, and it was expected to commence the supply this month.—*Times of India.*

Leek.—The Electricity Committee recommends, as an alternative to the existing scale, that current for power purposes, be offered at a payment of £1 17s. 6d. per quarter per KW. of maximum demand, plus one-third of a 1d. per unit for all current used. The maximum price per unit under this scale not to exceed the price under the original scale; and that the flat rate of 2d. per unit for heating and other domestic purposes (other than lighting) be reduced to 1½d. per unit.

London.—WOOLWICH.—On account of restricted lighting the electricity department has allowed £180 off the Corporation's lighting account. Petitions are to be lodged against the two London Electric Supply Bills. The Finance Committee has considered a report from the borough treasurer on the question of the accelerated loan repayments in respect of the loans outstanding on plant at Plumstead electricity works, which under Sir John Snell's first report, in which he proposed the closing down of the Plumstead station, was to be replaced and become obsolete. The borough treasurer points out that Sir John Snell in his final report advised that the Plumstead station should not now be shut down entirely, but continued in use by the destructor steam only, and to otherwise hold the plant as for reserve purposes. The Council has decided to ask the L.C.C. to accept the ordinary repayments on the original loans in respect of the plant at Plumstead works, and to suspend the operation of the deed entered into on April 7th, 1913, for the acceleration of repayments within the next three years, having regard to the altered circumstances in connection with the Council's proposals in which the plant at Plumstead works will be kept in use.

BATTERSEA.—The Electricity Committee recommends that during the time restrictions on outside lighting are in force, a reduction of 75 per cent. be made in the contract charges in respect of hire and maintenance, &c., of lamps installed outside premises, subject to the condition that the period of the agreement be extended by the period during which the restrictions are in force.

The B.C. is recommended to present petitions against the London and District Electricity Supply Bill and the London Electric Supply Bill.

The L.C.C., as a result of its inquiry whether the B.C.s were in favour of the unification of electric supply in and near London and the terms on which they would be prepared to endorse the Council's scheme, finds four Councils opposed, 10 asking for postponement, and that five gave indefinite replies.

SOUTHWARK.—The B.C. has been recommended, in order to obtain a *locus standi*, to oppose the two London Electric Supply Bills.

HACKNEY.—The Finance Committee recommends the B.C. to accept the offer of the L.C.C. to advance £10,000 on account of the loan applied for in respect of expenditure on mains, and that application be made to the L.C.C. for sanction in writing to the borrowing of the sum of £22,652, being the balance of the amount sanctioned.

Masham.—E.L. SCHEME.—The U.D.C. has concluded an agreement with the promoters of a scheme for supplying the district with the electric light.

Nantwich.—PROV. ORDER.—The Crewe Corporation has asked the R.D.C. for its consent to the granting of an order by the B. of T., authorising the Corporation to supply Wistaston Manor and other places in the township with electricity, which would also be available for street lighting.

New Zealand.—The Timaru Borough Council has been offered a supply of power from Lake Coleridge at £6 per H.P. per annum. It is not stated whether this is on the maximum installed power or on the average power used.—*New Zealand Shipping and Commerce.*

Plymouth.—RECEIPTS AND ESTIMATES.—The return for the three months ended December 31st of the Prince Rock section of the Corporation electricity undertaking shows receipts £9,298, compared with £9,518 in 1914; 888,996 units were sold as against 901,843 units in the corresponding period of last year. The Electricity Committee anticipates an expenditure in the next financial year on public lighting in the Plymouth area of £7,763, Devonport area £5,010, and Stonehouse area £965, a total of £13,738. The estimates for the electricity undertaking were for the Princes Rock section an income of £32,140, as against £32,750; and a net profit of £2 066, out of which it was proposed to spend £1,800 on meters, mains, service transformers, &c., carrying £286 to the reserve. For the Ker Street section, the estimated income was £23,164, as against £22,599, and a net balance of £1,759. On capital account on the Ker Street section it was decided to provide an expenditure of £4,500.

South Africa.—The Durban Corporation has decided to appropriate a sum of £350,000 from the £960,000 loan for public works, for the extension of the water supply, electric lighting, tramways, telephone system, and other municipal enterprises —*Board of Trade Journal.*

Street.—E.L. SCHEME.—A limited company is to be formed at once for the purpose of carrying out the electric lighting scheme. Messrs. Christy Bros. are to take over the public lighting on an agreement for 10 years at £2 per lamp per annum.

Walthamstow.—NEW TURBINE PLANT.—The Lighting Committee has decided to enter into a contract with the Brush Co. for the supply of a 1,500-KW. Ljungstrom turbine, at £6,996, the contractors to agree to open out the turbine for inspection at the end of 12 months, it being understood that the turbine will not be taken over if the blading shows any appreciable signs of wear, the contract to further provide that the set will be replaced by a 1,500-KW. disk and drum turbine in accordance with the tender for that type of plant, should the Ljungstrom set fail to comply with requirements.

West Ham.—LINKING-UP PROPOSAL.—The electrical engineer has been instructed to report on the possibility of linking-up with the Poplar electricity undertaking for mutual supply purposes.

Willesden.—Owing to the shortage of carbons, the Electricity Committee proposes to convert as many as possible of the existing arc lamps to metal-filament lamps. The engineer was instructed to obtain quotations for insurance against loss by fire of apparatus which had been loaned out to consumers. The Council has been recommended to petition against the London Electric Supply Bills. As the Council's agreement with the North Metropolitan Electric Power Supply Co. expires on March 31st, 1918, the Electricity Committee is of opinion that the electrical engineer should be instructed to report generally upon what terms the agreement may be renewed for a further period of seven years, and also alternatively to submit preliminary plans and estimates for the erection of a new generating station, either on the site acquired by the Council for the purpose, or any other suitable site.

Worksop.—The Traders' Association has forwarded to the U.D.C. a resolution of protest against the suggestion of the Lighting Committee to embark upon municipal trading, on the ground that it would be detrimental to the interests of the individual traders of the town. The matter has reference to the decision of the Council to support the Bill of the I.M.E.A.

Yorkshire Electric Power Bill.—The Birkenshaw Council has decided to recommend the West Riding C.C. to safeguard the interests of the local authority by reserving to it the right at any time to supply power in the district; the Bingley Council has decided to lodge a petition against the Bill in respect of East Morton, and the Brighouse Corporation has resolved to oppose the Bill.

TRAMWAY and RAILWAY NOTES.

Aberdeen.—P.A.Y.E. CARS.—Some time ago, residents in Mannofield and district petitioned the T.C. urging the discontinuance of the P.A.Y.E. cars, but the Corporation Tramways Committee recommended that as the new plan had only been in operation for a few months no action be taken. The matter is not ended, however, as the Town Council is to receive a deputation at its next meeting, and notice of motion has been given that the system be abolished on all Corporation cars.

Argentina.—The Buenos Aires City Council has conceded to the Anglo-Argentine Tramway Co. a period of one year in which to commence the work on the subterranean line from Retiro to Constitucion; this period to commence when peace has been officially stipulated between the various nations. The prorogue is granted under the express condition that the construction of the line will terminate within a period of two years after commencement, failing which the fines provided for in the concession will be applied.—*Review of River Plate.*

Blackpool.—Parcels System.—The Corporation is introducing a tramway parcels system, to come into force on February 8th. It was hoped the system would extend to all the Fylde tramways, but as arrangements have not been made with the Fleetwood Co. the service will only apply to Blackpool Corporation and Lytham and St. Anne's tramways.

Continental.—Italy.—By a supplementary agreement, the company which secured the concession in December, 1910, to construct the steam railway from Umbertide to Todi and Terni, has been empowered to substitute electric for steam traction. The company proposes to adopt the single-phase system at 1,000 volts and 25 periods. The estimated cost of the installation is 21,220,000 lire. The Government contributes a subsidy of 9,600 lire per km. for 50 years.

Spain.—Application has recently been made to the Spanish Government for a concession for the construction and working of an electric tramway between Madrid and the Escorial, which is largely visited by tourists during the summer season.

Croydon.—The B.C. has sanctioned tramway improvements at an estimated cost of £2,957—a new loop each for the Addiscombe and Norwood routes, and the provision of an auxiliary feeder for the latter.

Dewsbury.—Tramway Extensions.—The ratepayers have approved the clauses in the Corporation's Parliamentary Bill relative to the spending of £8,190 for the purpose of proposed tramway extensions; £7,535 for the purchase of land and the provision of a depôt for tramcars and omnibuses, and £200 for the electrical equipment of the tramway.

Elland.—Tramway Extensions.—The U.D.C. has decided to support the Halifax Corporation's proposed Tramway Bill, so far as it relates to the extensions to Elland.

Halifax.—Proposed Tramway Extensions.—The statutory meeting of ratepayers held to consider the Corporation Bill sanctioned the extensions to Elland (£22,921) and Stainland (£15,463), but rejected the proposed extensions to Ripponden (£20,293). Approval was also given to the suggestion to double the track from Stump Cross to Shelf (£10,349), which would enable through cars to be run between Halifax and Bradford.

Huddersfield.—Nine Months' Working.—The receipts of the Corporation tramways for the nine months ended December 31st last amounted to £96,654, as against £88,235 for the corresponding period of the previous year. The total working expenditure has been £52,303, compared with £48,957, and the gross surplus is £44,351, compared with £39,278. Interest on capital, redemption of debt, &c., absorb £19,378, and after provision has been made for depreciation at 3 per cent., there is a net surplus of £13,912, compared with £9,995. The reserve or renewals account stands at £20,079, compared with a balance brought forward of £30,973.

The Finance Committee is to be asked to sanction the provision of £60,000 for capital expenditure on the Elland and Marsden tramway extensions.

London.—L.C.C.—The Highways Committee recommends the entering into an arrangement with the London Electric Supply Corporation for a further supply of power up to 3,500 kw. to the tramways, at £3 a kw. a year, plus ⅛d. per unit, for a period of at least six months. If after six months the power is required as stand-by, the charge will be £2 a kw. a year. The costs of cables, ducts, &c., for coupling up to the Deptford station will be some £6,850.

Plymouth.—Proposed Loan.—The Tramways Committee has recommended the T.C. to apply to the B. of T. for a loan of £5,000 for the provision of six additional tramway cars.

Rhondda.—Tramway Extension.—The estimated expenditure to be incurred by the U.D.C. in connection with the construction of new tramways and extensions, as proposed in the Council's Bill, is £25,567 and £2,400 for equipment.

Rotherham.—Proposed Tramway Expenditure.—In the proposed Parliamentary Bill provision is made for an expenditure of £9,108 for motor-omnibus services outside the borough, and £55,789 for the construction of over 5½ miles of tramways to Maltby.

Southend-on-Sea.—The Corporation has deferred consideration of tenders received for the supply of three motor-'bus chassis pending the result of inquiries into the use of electrically-propelled vehicles.

U.S.A.—According to the *Electrical World*, the official statement attributes the recent fire in the tunnel of the Interborough Rapid Transit Co., New York City, on January 6th, to a short circuit on certain feeder cables in manholes on either side of the subway in Fifty-third Street. Practically all the cables were short-circuited and destroyed, creating considerable gas and smoke from the insulation; at the same time owing to the tripping of the circuit-breakers, power was cut off the third rail and the trains were stopped. As our readers are aware, many people were held up in standing trains, several hundred being overcome by the fumes from the burning insulation and removed through manholes and gratings in the street. Moreover, 200 people were injured in the panic which occurred, one fatality being reported.

The trouble occurred at about 8 a.m., and by 4 p.m. the system was repaired sufficiently to operate local trains, and normal service was restored early next morning.

Electric Vehicle Savings.—As the result of the experience of Messrs. Marshall Field & Co., of Chicago, with a fleet of more than 200 electric trucks and vans, Mr. Stanley Field states that with electric trucks operating at a cost of $8 a day, the firm are able to perform delivery service which cost $13 a day with petrol trucks.

TELEGRAPH and TELEPHONE NOTES.

Canada.—The new automatic telephone exchange at Medicine Hat (Alberta) is now in operation. The exchange equipment is designed for 2,000 subscribers, while the outside cable construction provides for 3,000. In the new building twice as many subscribers can be accommodated.

Censorship of Telegrams.—In the course of a letter from the Secretary of State, Mr. Bryan, to Mr. Stone, Chairman of the Senate Foreign Relations Committee, defending the neutrality of the United States in the European War, the Secretary states that "the reason that wireless messages and cable messages require different treatment by a neutral Government is as follows:—Communications by wireless cannot be interrupted by a belligerent. With a submarine cable it is otherwise. The possibility of cutting a cable exists, and if a belligerent possesses naval superiority a cable is cut, as was the German cable near the Azores by one of Germany's enemies, and as was the British cable near Fanning Island by a German naval force. Since a cable is subject to a hostile attack, the responsibility falls upon a belligerent and not upon a neutral to prevent cable communication.

"A more important reason, however, at least from the point of view of a neutral Government, is that messages sent out from a wireless station in neutral territory may be received by belligerent warships on the high seas. If these messages, whether plain or in cipher, direct movements of warships or convey to them information as to the location of an enemy's public or private vessels, the neutral territory becomes a base of naval operations, to permit which would be essentially unneutral. As a wireless message can be received by all stations and vessels within a given radius, every message in cipher, whatever its intended destination, must be censored. Otherwise military information may be sent to warships off the coast of a neutral country. It is manifest that a submarine cable is incapable of becoming a means of direct communication with a warship on the high seas; hence its use cannot as a rule make a neutral territory a base for the direction of naval operations."—*Times*.

Norway.—The plant for the Stavanger trans-Atlantic wireless station, which had been ordered in England, was ready a long time ago at the manufacturer's works, but when the war broke out the shipment of it was prohibited. The Norwegian Government has, however, succeeded in getting the embargo removed, and recently there arrived in Norway 142 cases of materials, including the receiving apparatus for the main station at Märland, and the bulk of the machinery for the same as well as for the sub-station. The buildings at both places are nearly completed, and the work of installing the machinery will be commenced at once.

In the vicinity of Christiania a large wireless station is also going to be erected for the purpose of communicating with Sweden, Denmark and Russia. In the next Budget the Government will ask the Storthing for a sum of £5,555 for this station as a beginning.

Telegraphic Interruptions.—The great snowstorm of Friday last brought down telegraph and telephone wires in all directions, and caused serious interruptions throughout the Home Counties. The trunk telephone wires were particularly affected. Most of the damage was repaired during the week-end. Many overhead telephone wires were brought down in London by the damp clinging snow, and in some cases roof standards were displaced. Further damage took place on the following days, owing to falls of snow from roofs on telephone wires.

"Wireless" Wire.—It is reported that the Germans have seized £2,000 worth of copper from the Belgian Government's wireless installations in Brussels.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Brisbane.—March 10th. Motor-generator, power board, &c., for Postmaster-General. See "Official Notices" January 15th.

Aylesbury.—February 6th. U.D.C. Supply of electric motors to consumers (hire-purchase agreement). See "Official Notices" January 22nd

Blackburn.—February 13th. Corporation. Twelve months' supply of stores, including a number of electrical items, for the Electricity Committee. See "Official Notices" to-day.

Bolton.—February 11th. Corporation. Low-tension sub-station switchgear, for the Electricity Department. See "Official Notices" January 8th.

Bristol.—February 11th. Twelve months' supply of carbons, joint, junction and fuse boxes, wattmeters, ampere-hour meters, boiler castings, globes, &c. See "Official Notices" to-day.

Cardiff.—February 22nd. Installation, 750 points, at New Technical Institute, Cathay's Park, for the City Council. See "Official Notices" January 22nd.

Colchester.—February 6th. Corporation. Twelve months' supply of stores, including lighting fittings, car equipment, overhead equipment, cable, &c. See "Official Notices" January 22nd.

Darlington.—February 2nd. Corporation. Alternative tenders for 2,000-KW. and 3,000 KW. turbo-alternators; separate tenders for condensing plant. See "Official Notices" January 15th.

Dover.—Tram-rails, for the T.C. Deputy Borough Surveyor.

Dundee.—February 1st. Corporation. Supply of 15-ton overhead travelling crane for Walton electric sub-station. Specification from Mr. H. Richardson, Engineer, Electricity Department.

Halifax.—February 15th. Corporation. Twelve months' supply of stores, including lighting fittings and electrical accessories, cables, telephone wire, meters, &c. See "Official Notices" January 22nd.

Helsby.—The Parochial Committee, having heard a report on the electrification of the water and sewage stations, is obtaining tenders for the work from two local firms—the B.I. and Helsby Cables, Ltd., and the Mersey Power Co.

Hong Kong.—February 3rd. No. 5, steel structural work; No. 6, coal-handling plant. Specifications, &c., £1 each (returnable), from Messrs. Preece, Cardew & Snell.

Leeds.—February 20th. Corporation. Twelve months' supply of stores, including cable, mains boxes and fittings, jointing and insulating material, electric lamps, fittings, &c., for Electric Lighting Department. See "Official Notices" January 22nd.

London.—BERMONDSEY.—February 5th. B.C. Twelve months' supply of carbons and brushes, cable and jointing material, stoneware conduits, meters, demand indicators, main fuses, oils, meter boards, street frames, covers and joint-boxes. See "Official Notices" January 22nd.

L.C.C.—February 10th. Installation (184 wiring points, 246 lighting points) at Scawfell Street Elementary School, Hackney. See "Official Notices" to-day.

The L.C.C. is recommended to invite tenders for the supply of tramway fittings, equipment, &c., for 1915-16, and for a ventilating fan, for the Streatham sub-station.

ST. PANCRAS.—February 15th. B.C. Arc lamp carbons, for the Electricity Department. See "Official Notices" to-day.

ST. MARYLEBONE.—February 17th. Stores, including meter-boards, casings, &c., cables, box compound and insulating materials, &c., for Electricity Department. See "Official Notices" to-day.

Manchester.—February 3rd. Education Committee. Complete electric light and bell installation at the Alice Briggs Home, Heaton Mersey. Specification, &c., 21s. (returnable), from the Education Offices, Deansgate, Manchester.

(*a*) Electrically-operated elevator; (*b*) electrically-operated screening plant in connection with Davyhulme Sewage Works extensions. Specifications (£3 3s. each) from Mr. O. J. Wilkinson, Engineer, 196, Deansgate, Manchester.

February 5th. L.P. piping and valves at Stuart Street Station. Mr. F. E Hughes, Secretary, Electricity Department, Town Hall.

February 16th. Corporation. 12 months' supply of stores for the Tramway Department. See "Official Notices" to-day.

Newcastle-under-Lyme.—February 5th. Three-wire single, L.T. paper, lead-covered cable, armoured feeder and distributor mains, for the Electricity Department. See "Official Notices" January 22nd.

Portsmouth.—February 3rd. Corporation. Twelve months' supply of stoneware pipes, castings, street work, &c., for the Electricity Department. Forms of tender from the Electricity Station, Gun Wharf Road.

Redditch.—U.D.C. Two turbo-alternators, each 1,000 KW., with condensers, cooling tower, &c.; two synchronous motor-alternators of 300 KW. and 150 KW. respectively. See "Official Notices" January 8th.

Rochdale.—February 1st. The Electricity Committee invites tenders for sub-station buildings and sub-station switchboard at the new sub-station, Castleton, near Rochdale. Specifications, &c. (two guineas, returnable), from Mr. C. C. Aitchison, engineer and manager.

Rotherham.—February 22nd. Corporation. Two water-tube boilers, automatic mechanical stokers, economisers, superheaters, foundations, steel chimneys, steam valves, steam pipes, induced-draught plants, and all auxiliaries. See "Official Notices" to-day.

Spain.—February 5th. The Spanish Post and Telegraph Authorities in Madrid are inviting tenders for the concession for the working of the telephone system in the town of Valls (Province of Tarragona) during a period of twenty years.

Woodstock.—February 4th. Generating plant, switchboard, battery, wiring, lamps and fittings (120 points), for the Union Workhouse. See "Official Notices" January 15th.

CLOSED.

Coventry.—The Corporation has placed an order with Messrs. Edward Bennis & Co., Ltd., of Little Hulton, for the following:—

Complete coal and ash handling and storage plant, consisting of wharf conveyor, cross conveyor, distributing conveyor, ash-gathering conveyor, ash-discharging conveyor, and all structural supports and accessories; also the whole of the steelwork contained in the boiler house, overhead bunkers, boiler-house roof, economiser floor and boiler-house floor. The order also includes eight "Bennis" patent chain-grate stokers, each 7 ft. wide by 13 ft. 6 in. centres, to be fitted to eight B. & W. boilers.

Haslingden.—The Corporation has placed the contract for the electric light and power installation in the new Central Council Schools with Mr. A. M. Cramp, of Haslingden.

Heckmondwike.—The U.D.C. has accepted the tender of Messrs. Goodbrand & Co., at £250 (less £20 allowed for old tubes), for a new economiser at the power station.

Helsby.—The Parochial Committee has accepted the tender of the Mersey Power Co. (£36) for provision of a signal wire from the reservoir to the pumping station.

Leicester.—The T.C. has been recommended to seal a contract with Messrs. F. Webb & Son for installing electric light, fittings and bells in the new sanatorium buildings, at £433.

London.—L.C.C.—The Education Committee reports having accepted the following tenders for electric lighting:—

The Victoria School, Hammersmith, £270; Senior Street School, Paddington, £375; Woolmore Street School, Poplar, £210; Star Lane, Fulham, £285.—Defries & Goldman.

The Stores and Contracts Committee reports the receipt of the undermentioned tenders for the provision of an electric lift (including guides and gear) for passengers and light goods at the stores premises in Clerkenwell Close:—

Titan Lift Co., Ltd.	£450
Smith, Major & Stevens, Ltd.	450
Ditto Alt. tender (not according to specification)	422
Easton Lift Co., Ltd.	463
Ditto Alternative tenders, £443, £445, and up to	523
Spagnoletti, Ltd.	463
Waygood-Otis, Ltd.	475
Ditto Alternative tender	455
Aldous & Campbell, Ltd.	495
Medway's Safety Lift Co.	502

The chief engineer's estimate was £385. The lowest tender in accordance with the specification was that of the Easton Lift Co., Ltd., of £443.

The Committee reports having accepted another tender of the same firm (£445), as that tender embodies certain different arrangements which are desirable. Permission has been given to the company to sublet—(1) to the General Electric Co., Ltd., the supply of the motor, and (2) to Messrs. Latch & Batchelor the supply of the steel ropes.

The Committee has given instructions for 10,000 tons of coal to be obtained from Messrs. Wm. Cory & Sons, Ltd., as a reserve supply for the Greenwich generating station.

The following tenders were accepted by the Stores and Contracts Committee during the three months ended December 31st, 1914:—

For electric insulating material (Schedule No. 15):

L. Andrew & Co.—Items 1, 7 and 8.
British Electrical & Manufacturing Co.—Item 5.
British Westinghouse Electric & Manufacturing Co., Ltd.—Item 11.
G. Hattersley & Sons, Ltd.—Item 12.
I.R., G.P. & Telegraph Works Co., Ltd.—Item 2.
G. MacLellan & Co.—Item 3.
A. Terry & Co.—Item 10.
J. Thompson.—Item 9.

Electric cables, wires and flexible cords (Schedule No. 16):

British Insulated & Helsby Cables, Ltd.—Items 1 and 5.
Hooper's Telegraph & I.R. Works, Ltd.—Items 2, 3, 4, (*a*) and (*b*) 6, 7 and 8.

Electric lamps (Schedule No. 17):

British Thomson-Houston Co., Ltd.—Items 1 to 7 (carbon-filament lamps).
Crypsleo, Ltd.—Items 8 to 27 (metallic-filament lamps with filaments not of "drawn" wire).

The following contracts have been continued during the three months ended December 31st, from January 1st, 1915, to December 31st, 1915:—For bitumen, pitch and green oil, for the Tramways Department (Schedule No. 47):

E. Catchpole & Sons.—Item 3.
Forbes, Abbott & Lennard, Ltd.—Item 2.
Grindlay & Co., Ltd.—Items 2 and 3.
W. H. Keys, Ltd.—Item 1.

BATTERSEA.—The B.C. Electricity Committee recommends that the tender of the Edison & Swan U.E.L. Co., Ltd., be accepted for two additional panels to the switchboard at the electricity generating station, at £151.

HACKNEY.—The B.C. Electricity Committee reports that, as a result of an inquiry by the Borough Electrical Engineer of the various contractors in connection with mains materials, as to whether they would be prepared to renew the existing contracts for a further period of three years without an advance in price, the British Insulated & Helsby Cables, Ltd., is prepared to extend the current contract for cables and boxes for three years at the existing prices, in connection with the contract for cables; the prices are subject to a sliding scale covering market quotations in the cost of copper and lead. The Committee recommends that this offer should be accepted. In regard to the other contracts: Messrs. W. Lucy & Co., Ltd., for boxes; Leeds Fireclay Co., Ltd., for troughing; Messrs. J. Joberns & Co., for blue cover tiles; these firms are not prepared to renew the contracts at current prices. The Committee therefore recommends that such boxes as cannot be supplied under the contract from the British Insulated & Helsby Cables, Ltd., and troughing and blue cover tiles, as may be required, be bought from time to time without a special contract.

SOUTHWARK.—The E.L. Committee proposes to purchase two 5-H.P. motors from Mr. H. J. Hawkins at a cost of £25 each.

Reading.—The Borough Education Committee has accepted the tender of Messrs. H. W. Cox & Co., of London, for an X-ray apparatus, worked from the 210-volt D.C. mains, at £136.

Teddington.—The U.D.C. has accepted the tender of Messrs. J. B. Marr & Co. for the electric light plant at the sewage works, at £545 or £556, according to the type of oil engine selected by the Engineer.

Walthamstow.—The Lighting Committee has accepted the tender of Messrs. Hobdell, Way & Co., at £25, for repairing the boiler lagging at the electricity works.

West Ham.—The Town Council has been recommended to extend the contract with Messrs. Manfield for supplies of stoneware ducts required for one or two years, provided the Electrical Engineer can effect this at the same price.

Wrexham.—The B. of G. has accepted the tender of Messrs. E. O. Walker & Co. for electric light wiring and fittings at the new Scattered Homes for Children, at £27 15s.

York.—The Tramways Committee recommends acceptance of the tender of Messrs. James Russell & Co., Ltd., for the supply of poles required in connection with the overhead work for the Hull Road extension, at the sum of £538; and that of Messrs. Tramways Supplies, Ltd., for the remainder of the material required in the work, at £556. Additional cars are required for the Hull Road route, and the tramway manager has been instructed to obtain alternative tenders for the supply of six single or six double-deck cars.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, January 29th. At 8 p.m. At 39, Victoria Street. Debate on "London's Future Electricity Supply," opened by Mr. P. C. Batstone.

(Sheffield and District Branch).—Friday, January 29th. At 8 p.m. At Cutler's Hall, Sheffield. Ordinary meeting.

(Midland Section).—Saturday, January 30th. Social Evening.

Institution of Electrical Engineers (Birmingham Local Section).—Friday, January 29th. At 7.30 p.m. At University, Edmund Street. Lecture on "Kelvin's Work on Gyrostatics," by Prof. A. Gray, F.R.S.

(Students' Meeting).—Wednesday, February 3rd. At 7.30 p.m. At Victoria Embankment, W.C. Paper on "High Explosives," by Mr. H. Williams.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, January 29th. At 7.30 p.m. At Bolbec Hall, Newcastle. Ordinary Meeting.

(Graduates' Section).—Saturday, January 30th. At 7.15 p.m. At Bolbec Hall. Paper on "Some Notes on Ship Resistance," by Mr. A. P. Pattenson.

Association of Mining Electrical Engineers (Lancashire, Cheshire and North Staffordshire Branch).—Saturday, January 30th. At 6.30 p.m. At Grosvenor Hotel, Deansgate, Manchester. Presidential Address by Mr. B. Shaw, and paper on "Prevention of Electrical Accidents in Mines," by Mr. T. J. Nelson.

Royal Society of Arts.—Monday, February 1st. At 8 p.m. At John Street, Adelphi, W.C. Cantor Lecture (III), on "Oils, their Production and Manufacture," by Dr. F. Mollwo Perkin.

Wednesday, February 3rd. At 8 p.m. "Imperial Industrial Development after the War," by Mr. O. C. Beale.

Society of Engineers.—Monday, February 1st. At 7.30 p.m. At Institution of Electrical Engineers, Victoria Embankment, W.C. Presidential Address by Mr. Norman Scorgie.

Institute of Marine Engineers.—Tuesday, February 2nd. At 8 p.m. At Tower Hill, Minories, E.C. Paper on "Small Screw Propellers," by Mr. D. H. Jackson.

Rontgen Society.—Tuesday, February 2nd. At 8.15 p.m. At Middlesex Hospital, W. Paper on "Measurement of the Radiation from the Coolidge and other X-Ray Tubes in Clinical Use," by Dr. S. Russ.

Greenock Electrical Society.—Thursday, February 4th. At 7.45 p.m. At 21, West Stewart Street. Paper on "Illumination," by Mr. F. B. Humphriss.

Royal Institution of Great Britain.—Friday, February 5th. At 9 p.m. At Albemarle Street, W. Paper on "Science and Industrial Problems," by Prof. A. W. Crossley, F.R.S.

Monday, February 1st. At 5 p.m. General meeting.

NOTES.

Cable Manufacturing at Perivale: Correction.—In one of our "War Items" of January 15th we gave a summary of some remarks made by the Surveyor to the Greenford District Council, respecting the firm of Geipel & Co., who are constructing cable manufacturing works at Perivale. We reported him as saying that "the head of the original firm was naturalised in 1848," but we are informed that what he actually did state was "that a Mr. Geipel had been naturalised in 1848, but that he did not know if he was the father of the senior member of the firm," adding that "all the members of the firm were British born, and that there was not any German capital in it." In case the report should have misled any of our readers we wish to remind them of the letter issued by the firm in September last, when so many houses were clearing away misunderstandings as to their constitution, in which it was pointed out that the principal of the firm was British born and bred, and that its capital and employés were entirely British also. Those who know Mr. W. Geipel, as we have done, personally for the past 20 years, will recognise that the 1848 naturalisation reference could not relate to him seeing that he is well on the right side of the age that such a date would give him.

Institution and Lecture Notes.—Institution of Electrical Engineers.—On December 16th, the inaugural meeting of the HONG-KONG LOCAL SECTION was held in the R.A. Theatre, Victoria Barracks, Hong-Kong. The meeting was of a semi-public character, and engineers from the various works and companies in the vicinity were invited, in addition to members of the Institution. Members also had the privilege of bringing their lady friends. His Excellency the Governor and Lady May and a party of friends attended, accompanied by the General Officer Commanding the Forces, and also the Commander of the Fleet.

Col. Baker-Brown, M.I.E.E., officer in command of the Royal Engineers, read an interesting paper entitled, "Some Military Uses of Electricity." Owing to the mixed assembly, the author did not treat the subject so much as a technical matter, but more in a descriptive manner maintaining the interest of the non-technical with amusing references to the various difficulties encountered in the field, camp and barracks. It was of great interest to the technical people present to hear that the army can lay some 2½ miles of telephone line on light poles within an hour, also that the wire usually consists of strands of steel as well as copper, to enable it to withstand the rough handling during field operations. The beautifully "flat" lead curve and consequently high load factor of the military generating stations was the subject of envious comment by the central station engineers present.

At the conclusion of the paper, Mr. W. L. Carter, M.I.E.E., chairman of the Local Section, proposed a vote of thanks to the author, to which Col. Baker-Brown suitably responded.

The following members of the I.E.E. were present:—

Mr. W. L. Carter (chairman), chief engineer, Telephone Co., Hong-Kong.

Col. Baker-Brown (vice-chairman) Officer Commanding R.E.

Professors A. Warren (hon. sec.) and C. A. M. Smith, Hong-Kong University. Messrs. F. T. Williams, chief engineer, Naval Yard, Hong-Kong; R. F. Long, G. R. Archdeacon and C. H. N. M. Hamilton, China Light and Power Co., Kowloon; and F. J. Gelston, W. C. Jack & Co., Ltd., Hong-Kong.

The chairman was to give his address during the course of this month; Prof. C. A. M. Smith is also to give a paper, and the session will be concluded with a paper by Mr. C. H. N. M. Hamilton on "Methods of Harmonic Analysis."

At the meeting of the MANCHESTER LOCAL SECTION on Tuesday last a paper was read by Mr. T. D. Robertson on "Electric Steel-making Furnaces," and was followed by a discussion.

Salford Technical and Engineering Association.—The Syllabus for 1915 of this Association includes the following items:—

February 13th.—"How Plants Protect Themselves," by Mr. J. E. McDonald.
March 6th.—"The Strength of Iron Castings," by Mr. E. L. Rhead.
April 3rd.—"Lifting Machines," by Mr. D. Kirby.
May 5th.—Visit Gresley Iron Works.
June 12th. Visit Stuart Street Power Station, Manchester.
July 10th.—Visit Barton Hall Engine Works, Patricroft.
August 21st.—Visit Messrs. Pilkington, Tile and Pottery Co., Clifton Junction.
September 4th. "Ball and Roller Bearings," by Mr. A. H. Hunt.
October 2nd.—"The Wonders of Coal," by Mr. G. R. Kew.
November 6th.—Members' Short Papers.
December 4th.—Visit Salford Corporation Cleansing and Flagmaking Departments.
December 27th.—Annual Social.

Wireless Society of London.—Mr. A. A. Campbell Swinton, who delivered his presidential address on Tuesday, gave an interesting series of experiments illustrating how the discovery of "wireless" was led up to.

Electric Lamps in Mines.—The value of the miner's electric lamp was exemplified in an explosion at the Minnie Pit, Halmerend, Staffordshire, recently, which resulted in the death of nine men and injury to 18 others. The survivors were in total darkness, in a foul atmosphere, until an electric lamp was found which enabled them to reach a place of safety.

A dispute has arisen in the South Wales coalfield, one of the points at issue being the introduction of safety lamps into naked light collieries without the customary extra payment; the owners contend that the improvement in oil and electric safety lamps has removed the disadvantage of illuminating power, upon which increased payment was based.

Appointments Vacant.—Shift engineer for A.C. work (30s.), for Neath U.D.C.; overhead lineman (35s.), for Kirkcaldy tramways department; temporary clerk (30s.), for Swindon electricity and tramways department; shift engineer (26s.), for Heywood Corporation electricity works; charge engineer, during the war (37s.), and switchboard attendant, permanent (27s.), for Wakefield electricity department; junior assistant electrical engineers (15s.), for Newcastle-upon-Tyne Electric Supply Co. Particulars are given in our advertisement pages.

The Electric Vehicle Committee.—A meeting was held on January 8th, when the secretary submitted a report as to the issue of the first number of *The Electric Vehicle*, which was considered satisfactory. He also submitted a return as to the sales of the Publicity Mail Cards, which showed that only a comparatively small quantity of these had been ordered so far.

The Committee decided to circularise the various undertakings to find out how many standard charging signs would be required, so that it might make arrangements for their production by one manufacturer.

An intimation was received from the Tungsten Lamp Association stating that they had appointed a Sub-Committee to go into the proposed standardisation of glow lamps with the Electric Vehicle Committee, and it was decided to invite this Sub-Committee to meet the Technical Sub-Committee of the E.V.C. at its next meeting.

The Committee had before it the sizes of wheel rims for solid tires standardised by the Engineering Standards Committee at the instance of the Society of Motor Manufacturers and Traders, and decided to recommend purchasers of electric vehicles to insist upon having these standard rims fitted. The question of charging equipments is being further gone into.

The next meeting is fixed for the 5th proximo.

Fatalities.—At Lye, on January 20th, an inquest was held on the body of Ernest A. Bristow, 15, of Pedmore Road, Lye, who was killed on the 16th inst. The lad was employed in the enamelling department of Messrs. Weson Bros., Ltd. Arnold Baker, ironplate worker, said the boy was helping him to put a new piece of piping on a stove which warmed one of the rooms. The pipe was supported by a piece of wire from a beam along which ran an electric cable, and was also attached to some pieces of sheet-iron which had been fastened up, and which were found to be alive with electricity. They had put the pipe where they wanted it, and just as they were going to loose it there was a flash and a shock, witness going one way and Bristow the other. Bristow cried "Oh!" several times, and groaned. Artificial respiration was tried without success.

Terah Shearer, foreman of the enamelling department, said that a 200-volt current was passing through the electric wire. They had had the cables tested, but could not yet find any leakage. Dr. Hardwick said there was no doubt the electric shock was the cause of death. The jury returned a verdict of "Accidental Death."

An inquest was held at Hednesford on January 21st into the death of Joshua Thomas, 55, who had been employed by the West Cannock Colliery Co., at Hednesford. On January 19th, a 6-in. nail was found driven into an electric cable on the main engine road of the pit, near where his body was found. Dr. A. Gardner said that when he was called to the colliery Thomas was dead. There were burns on his right hand and forearm, and an abrasion on the right side of his face, probably caused by falling. Witness attributed death to cardiac failure, due to electric shock. Percy Hooper, a nipper, said he saw Thomas go to the cable, but did not notice him do anything, as he had his back towards him. A moment later Thomas fell groaning. Witness then noticed a long wire nail sticking in the cable. It was driven in about ½ in. Other evidence showed that the nail had not been seen in the cable previously. It was examined on the morning of the accident because a complaint had been made of a shortage of current. Henry Holcroft, chief electrician at the colliery, said the cable was alive all day and all night. Thomas would receive a 330-volt shock. The normal full voltage of the cable was 650 volts. Witness fetched the nail out of the cable. The shape of the hole in the cable indicated that the nail had not been driven in, but worked up and down by hand and forced in. The Coroner remarked that the deeper they went into the matter the more it appeared that Thomas must have put the nail in the cable himself. Nobody but an ignoramus, or a lunatic, would have done such a thing. The verdict of the jury was that "Death was due to misadventure through coming into contact with the nail in the cable, but that there was not sufficient evidence to show how it came to be there."

Mr. J. T. Arthurs, electrician at Messrs. Starkey, Knight and Ford's Brewery, at Tiverton, was killed on Tuesday last week. His coat was caught by a revolving shaft while he was oiling it, and he was drawn up between the girders, with the result that his arms were pulled from the shoulders.

Metropolitan Association of Electric Tramway Managers.—A meeting of this Association was held on Friday, 15th inst., at the Municipal and County Club, Whitehall, S.W., when the following were present:—Messrs. Ullmann (East Ham), chairman; Schofield (Leyton), vice-chairman; Coveney (Erith), Harvey (Ilford), Moffet (West Ham), Goodyer (Croydon), hon. secretary; Mason (South Metropolitan), Mackinnon (London United), Hammond (Metropolitan Electric), and C. Mittelhausen. Messrs. Murray (Walthamstow) and Stokes (Bexley Heath) were unable to attend. Mr. A. Coveney, formerly engineer and tramway manager at Erith, was entertained to dinner, on his resignation as a member of the Association.

Electricity Committees and Coal Supplies.—A trade correspondent says large consumers of coal and particularly those in control of electricity and gasmaking plant are becoming alarmed by the shortage in the supply of coal. With a view to securing relief in this direction the Manchester and Salford Corporations are convening a conference of various municipal authorities, to pass a resolution requesting the Government to suspend the operation of the Coalmines Regulation Act, 1908, and, thus enable colliers to work more than eight hours a day. The conference will be held in Manchester. Similar resolutions have been adopted in Glasgow.

Freemasonry.—The second regular meeting of the Kelvin Lodge, No. 3,736, was held on Friday, January 22nd, at Mark Mason's Hall, where, in spite of the inclement weather, a goodly number of brethren supported the Worshipful Master W. Bro. Delebecque, both in the lodge and at the festive board. The next regular meeting will be held on Friday, March 26th, at 5 p.m., at Mark Mason's Hall.

Educational Note.—NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS.—A Scholarship will be offered for competition among Graduates of the Institution in September next, tenable for two years, and of the annual value of £50. Particulars may be had from the Secretary.

Radium.—The director of the United States Bureau of Mines announces in his annual report that the technical experts of the Bureau have devised a process for the extraction of radium from ores which can be used on a large scale, and which is more efficient than that used by the largest foreign producers of radium. It is believed that the cost of radium to the consumer will be reduced to one-third of the present price.—*Chemical Journal.*

An American Proposal to Australia.—A proposition has been put before the Australian Premier for the establishment of a co-operative colony of American citizens in New South Wales. A society with 1,000 bondholders, with £100 as the membership fee, would take to its adopted country £100,000. As to 40 per cent. the settlement would consist of mechanics, and both primary and manufacturing industries would be engaged in. The manufacture of paper, electrical enterprises and the manufacture of machinery are mentioned.

Concert.—Messrs. Babcock & Wilcox's annual concert, which will be held at King's Hall, Holborn Restaurant, on February 12th, commencing at 7.30 p.m., will be devoted this year to the purposes of the Red Cross Society, and tickets will be on sale. The company hope that friends who have assembled in the past will strongly support the concert this year.

New Swedish Turbine.—From Gothenburg it is reported that trials have lately been carried out with a new type of steam turbine, which, it is hoped, will effect a saving of something like 30 per cent. in steam consumption, while the space occupied is considerably smaller than in the case of existing types.

Electricity from Saw-Dust.—An electrical power station is about to be erected at Gusne, in Sweden, at which sawdust from a saw-mill in the neighbourhood will be used as fuel. The saw-dust is directly conveyed from the saw-mill to gas producers specially constructed for this kind of fuel, and transformed into electrical energy in the usual way. It is estimated that the saw-dust available is sufficient to produce 2,200 electrical H.P., though the station to be built in the first instance is only designed for 1,100 H.P. The cost of fuel will scarcely amount to more than 50 per cent. of the cost of production of electrical energy from water-power in Sweden.

An Interesting Table.—In view of recent expressions of opinion on the ethics of advertisement, we may allow ourselves to comment on a novel table which appears in our advertisement pages to-day. The views which it represents may or may not meet with general approval; but that it attracts and holds the attention of the reader, we think, will not be denied. As a basis for discussion at a meeting of practical men it would probably lead to a most interesting debate, if not to blows, and if the Society of Supervising Electricians, for instance, were to adopt it for this purpose we should look forward to the meeting with keen anticipation.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—The Coventry T.C. Electricity Committee has decided to grant the following increases of salary in the electricity department:—MR. E. V. NEWBOULD, chief clerk, from £4 to £4 10s. per week; MR. A. A. HARRIS, second clerk, from £2 10s. to £2 15s.; MR. A. V. LEESON, collector, from £2 10s. to £2 15s.; MR. P. SNAPE, assistant mains engineer, from £2 15s. to £3 5s.; MR. PETTIPHER, engine-room foreman, from £2 to £2 5s.

MR. J. W. BURR, late of Croydon, the new borough electrical engineer of Swansea, was welcomed to his new sphere of labour at a staff dinner held at the Royal Hotel, Swansea, on Thursday

evening last week. Col. Alex. Sinclair (chairman of the Electric Lighting and Tramways Committee) presided, and was supported by Ald. Geo. Colwill (vice-chairman), Ald. David Davies, Messrs. David James (Tramways Co.), A. L. Furneaux (electrician) and others. The guests and staff numbered nearly 70. The Chairman, in introducing Mr. Burr, said he thought they should follow the patriotic motto, "Business as usual." Mr. Burr had come to Swansea with the full intention of "booming the show." Mr. Burr met with a most cordial reception. He appealed to the staff not to be "clock-watchers," but to put their whole energies into their work. He accepted the chairman's challenge, which in effect was to get on or get out. Referring to the discussion at the recent Council meeting, he said that, as a mechanical engineer, he professed to know something about suction gas, but now after hearing that £4 per week could be saved by using it instead of electricity, he came to the conclusion that he knew nothing about it.

MR. HAROLD GRAY, electrical engineer, applied to the Accrington Electricity Committee, on January 21st, for permission to take a commission in the new Artillery Brigade. The requisite permission was given. Mr. Gray was senior lieutenant in the Territorial Artillery. It was understood arrangements would be made for carrying on the work at the electricity station under Mr. Gray's assistant, the Corporation to have the benefit of Mr. Gray's services in a consultative capacity during the time the proposed Artillery Brigade is in Accrington.

Owing to the state of his health, MR. C. ATCHISON, borough electrical engineer of Rochdale, has received permission of the Electricity Committee to be away from duty for some weeks from the beginning of February.

The Aldershot U.D.C. has increased the salary of MR. EBERT, first assistant at the electricity works, to £143 per annum, rising by £6 10s. a year to a maximum of £156.

General.—The undernoted changes have taken place this week in the staffs of the following companies: Metropolitan District Railway Co., London Electric Railway Co., City and South London Railway Co., Central London Railway Co.:—MR W. E. MANDELICK, in addition to his office as secretary to the above companies, is appointed business manager. MR. Z. E. KNAPP is appointed manager for maintenance and construction to the above companies. MR. H. E. BLAIN is appointed operating manager to the above companies. MR. W. E. BLAKE, in addition to his position as superintendent of the line to the District Railway, is appointed superintendent of the line to the London Electric, City and South London, and Central London Railways, in place of Mr. J. P. Thomas, who has resigned his position with these companies, to become general superintendent of the London General Omnibus Co., Ltd. In this capacity MR. THOMAS will have charge of all the work of operation, under the general control of the operating manager, Mr. Blain.

At St. Ann's Church, Stanley, on January 21st, the marriage took place of MR. HARRY COOPER, A.I.E.E., of Stoneycroft, and Miss Annie Rose Watkins, youngest daughter of the late Mr. Richard Watkins, Liverpool and St. Helens.

MR. JOHN GILBERT, of Farcet, Peterborough, has secured an appointment as electrical engineer to the Co operative Goldfields, Ltd., West Africa, and sails at the end of this month.

MR. ARTHUR J. FOORD has been appointed first assistant electrical engineer-in-charge at the new Naval Dockyard at Rosyth. He has, for 26 years, been in the electrical engineers' department at Chatham Dockyard.

MR. C. F. D. SUGGATE, A.M.I.E.E., A.M.I.Mech.E, who for the past four years has been engaged as an assistant engineer in the electrical engineer's department of the Great Eastern Railway, has resigned his appointment in order to take up a commission in His Majesty's Army as a temporary lieutenant (Inspector of Ordnance Machinery) in the Army Ordnance Department. His address is now c/o Ordnance College, Red Barracks, Woolwich.

The marriage has taken place at Holy Trinity Church, Weymouth, of MR CHRISTOPHER HODGSON, chief electrician of H.M.S. *Commonwealth*, and Miss Ethelind Burt, only daughter of the late Mr. James Burt.

MR. WALTER BIRCHALL, transformer expert in the service of the Riegos y Fuerza del Ebro Co., Barcelona, was married a few days ago at the British Consulate, Barcelona, to Miss A. A. Winstanley, of Leigh.

Obituary.—MR. W. MORTON, formerly Superintendent of Post Office Telegraphs at Southport, died at Southport last Friday, at the age of 76 years. He retired from the telegraph service about 18 years ago.

NEW COMPANIES REGISTERED.

Caerphilly Electric Supply Co., Ltd. (139,086).—This company was registered on January 22nd with a capital of £6,000 in 400 cumulative preference shares of £5 each, 1,500 preferred ordinary shares of £1 each and 2,500 ordinary shares of £1 each, to carry on the business indicated by the title. The subscribers (with 50 shares each) are:—J. H. Edwards, Haresfield, Stonehouse, Gloucester, engineer: A. A. Douglas, Brendon, Colwyn Bay, manufacturer. Private companies. The number of directors is not to be more than six: J. Herbert Edwards is first managing director; qualification, 50 shares. Solicitors: Seymour Williams & Co., 88, Parliament Street, S.W.

Cinema Supplies, Ltd. (9,306).—This company was registered in Edinburgh on January 20th, with a capital of £1,000 in £1 shares, to manufacture and trade in cinematograph films, carbons, electrical plant, &c. The subscribers (with one share each) are:—R. Ralston, 113, St. Vincent Street, Glasgow, cashier: N. A. Henderson, 113, St. Vincent Street, Glasgow, law clerk. Private company. The first directors are not named; remuneration, £50 each per annum (chairman, £75).

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Telephone Company of Egypt, Ltd.—A memorandum of satisfaction to the extent of £1,200 on December 8th, 1914, of debenture stock covered by trust deed and deeds of acknowledgment, dated from July 27th, 1904, to October 27th, 1909, securing £200,000, has been filed.

Coatbridge and Airdrie Electric Supply Co., Ltd.—Further charge on the company's undertaking and property, present and future, including uncalled capital and Coatbridge and Airdrie undertakings, dated December 31st, 1914 (supplemental to charge dated October 17th, 1906), to secure £4,500. Holders: County of London Electric Supply Co., Ltd., Moorgate Court, Moorgate Place, E.C.

Spensers, Ltd.—Debenture dated January 5th, 1915, to secure £750 (ranking *pari passu* with £7,000 1st mortgage debentures) charged on the company's undertaking and property, present and future, including uncalled capital. Holders: S. F. Ellis, Unwin Street, Stratford-on-Avon, and S. Titterton, 79, Edmund Street, Birmingham.

Amazon Telegraph Co., Ltd.—Capital, £250,000 in £10 shares. Return dated December 1st, 1914; all shares taken up; £250,000 paid. Mortgages and charges: £277,800.

Spagnoletti, Ltd.—A memorandum of satisfaction in full on December 31st, 1914 (*a*) of trust deed dated October 22nd, 1907, securing £12,500; and (*b*) of second debenture dated April 23th, 1912, securing £3,000, has been filed.

Wadebridge and District Electric Supply Co., Ltd.—Debenture dated January 13th, 1915, to secure £350, charged on company's undertaking and property, present and future. Holder: C. E. Hannaford, York House, Perham Road, West Kensington.

Oriental Telephone and Electric Co., Ltd.—A memorandum of satisfaction to the extent of £300, on December 17th, 1914, of debenture stock, covered by trust deed dated June 28th, 1905, and deed of acknowledgment dated June 12th, 1907, securing £200,000, has been filed.

CITY NOTES.

Company Registrations in 1914.—In an article on this subject appearing in the *Investors' Guardian*, of January 23rd, the writer says:—"The motor and engineering groups shows large decreases, although the war has caused very great activity in certain departments of these trades. The textile group also returns a much smaller capital. The figures for the year show a heavy decline in land and development concerns, which may be traced directly to the slump in Canadian and American development enterprises. Electric companies have mustered only £1,100,000 of capital in the whole year; a remarkably small amount even for an industry which has long been in a depressed condition.

English Registrations.	1912.	1913.	1914.
No. of companies... ...	6,796	6,871	5,701
Coal and fuel	£4,973,845	£6,644,383	£3,482,550
Electric	7,579,780	6,102,389	1,130,350
Engineering and hardware	8,885,757	10,774,891	6,792,017
Gas	407,900	281,750	193,275
Motor, cycle and carriage ...	7,253,879	8,934,265	4,453,361
Oil	23,533,182	12,978,939	17,641,090
Plantation and rubber ...	3,209,965	4,338,500	3,004,427
Railways and tramways ...	3,164,200	2,754,007	1,761,000

Norway.—CALCIUM CARBIDE MANUFACTORIES AT ODDA.—According to the annual report of the Alby United Carbide Factories, Ltd., the results from last year's working were not quite so satisfactory as those for the preceding year. This was partly due to the great strike that took place, owing to which the production was reduced by 4,500 tons. During this strike period the company was obliged to pay for the electrical energy not employed, which, of course, involved a great expense.

The North-Western Cyanamide Co., of which the Alby Co. holds half the shares, has now for the first time paid a dividend, which was fixed at 15 per cent. The manufactories of this company are also situated at Odda, and are getting their energy from the Tyssefaldene. As regards the prospects for the year ending on June 30th, 1915, it was stated in the report that the work was shut down altogether when the war broke out, but taken up again soon afterwards to such an extent that about 40 per cent. of the energy at disposal was employed. The output has gradually been extended, and the works will shortly be fully occupied. During the last four months there has been shipped nearly twice as much carbide as in the corresponding period in 1913.

The assets of the Alby Co. amount to about £864,800, of which about £331,700 are represented by shares in the Nitrogen Products and Carbide Co.; the latter concern is financing the large Aura Co., whose plants are now under construction.

East London Railway Co.—The report for the year ended December 31st, 1914, gives the number of passengers carried as follows:—1914, 6,172,121; 1913, 5,149,064. The net income amounted to £35,667, plus £9,711 brought forward.

Stock Exchange Notice.—The Committee has appointed a special settling day as under:—

Thursday, February 11th.—Brisbane Electric Tramways Investment Co., Ltd.—Further issue of 30,000 ordinary shares of £5 each, fully paid, Nos. 90,001 to 120,000.

and has ordered the securities to be officially quoted.

Blackpool and Fleetwood Tramroad Co.—A dividend of 4½ per cent., making 6½ per cent. for the year, is announced.

Held Over.—Pressure upon our space compels us to hold over several City reports until next week.

Traction and Power Securities Co., Ltd.—The directors recommend a dividend of 4s. 6d. per share, free of income-tax, for the year 1914.

St. James's and Pall Mall Electric Light Co., Ltd.—The directors announce a dividend for the half-year ended December, 1914, of 5s. per share on the ordinary shares, making, with the interim dividend, 10 per cent. for the year. The rate for 1913 was 12 cent., and for 1912—10 per cent.

Liverpool Overhead Railway Co.—The directors recommend a final dividend (for the half-year ended December 31st last) at the rate of 5 per cent. per annum (less income-tax) on the preference shares, and 3½ per cent. per annum (less income-tax) on the ordinary shares, making, for the year, 5 per cent. on the preference and 3 per cent. on the ordinary shares.

Westminster Electric Supply Corporation, Ltd.—For the last half of 1914 a dividend at the rate of 8 per cent. per annum is announced, making 9 per cent. for the year. For 1913 and 1912 the dividend was 10 per cent.

STOCKS AND SHARES.

Tuesday Evening.

THE naval victory of last Sunday had a cheering effect upon Stock Exchange markets. Prices did not advance to any appreciable extent, but some of the softening which had previously appeared in certain sections turned into strength, and business on the whole was certainly quickened by the very satisfactory news.

Bit by bit the Treasury restrictions are being relaxed, and brokers find it easier to deal with perfectly *bona-fide* investment orders, to the execution of which no barrier should be placed. The Treasury policy is to prevent money from leaving the country, and, to this end, no modification has yet been granted in the direction of allowing the Stock Exchange to sell securities for anybody—ally, neutral or enemy—outside the confines of the United Kingdom.

The individual cases of hardship which this inflicts upon many French, Belgian and Dutch holders of securities, who have no possible connection with Germany, may well be imagined; and some people object to the Treasury acting not only in an arbitrary manner—this, of course, being reasonable enough in war time—but in a way which may possibly defeat its own ends, while imposing real suffering upon staunch friends. The Belgian refugee with £500 worth of securities which he has managed to take with him in his flight to Holland or to England, may well feel that he is being treated with undue severity in not being allowed by the Treasury to realise money by the sale of his stock in open market.

The broadening of business is noticeable chiefly in the purely investment securities, while in the more speculative issues trade is still largely to seek. It is surprising that there should be so little going on in electric lighting shares, where movements on the week are mostly downwards. This is due more to sentimental reasons than to actual pressure to sell as we have pointed out here on many occasions. The prices which have suffered this week are County of London Ordinary and Preference, City Ordinary and Preference, St. James's and Westminsters. Moreover, the market for the Debenture stocks is not so firm as it was. The principal reaction is in St. James's 3½ per cent. Debenture, the price of which reverted to 80. Metropolitan 3½ per cent. Debenture also came in, and was lowered to the same level as St. James's. The yield at this price is £4 7s. 6d. per cent. on the money.

Subjoined are our usual tables of Stocks and Shares:—

HOME ELECTRICITY COMPANIES.

	Mean price. July 27.	Jan. 26, 1915.	Rise or fall this week.
Brompton Ordinary	9½	8⅞	—
do. 7 per cent. Pref.	8⅝	8⅝	—
Charing Cross Ordinary	5½	4⅞	—
do. do. do. 4½ Pref.	4⅞	4⅞	—
do. do. City Pref.	4⅜	4	—
do. 4 Deb.	91½	90	—
Chelsea	4⅞	4⅜	—
do. 4½ Deb.	96½	92	—
City of London	16	14⅛	— ⅛
do. do. 6 per cent. Pref.	18½	12⅜	— ¼
do. do. 5 Deb.	116½	114	—
do. do. 4½ Deb.	100½	98	—
County of London	12	11½	— ¼
do. do. 6 per cent. Pref.	12	11¾	— ¼
do. do. 1st Deb.	102½	99	—
do. do. 2nd Deb.	100½	97	—
Kensington Ordinary	7½	7½	— ⅛
London Electric	1 7/16	1½	—
do. do. 6 per cent. Pref.	5 7/16	5	—
do. do. 4 Deb.	92½	89½	—
Metropolitan	3⅝	3⅜	—
do. 4½ per cent. Pref.	4 7/16	4	—
do. 4½ Deb.	97½	91½	—
do. 3½ Deb.	83	80	—1½
St. James' and Pall Mall	9⅝	9	—
do. do. do. 7 per cent. Pref.	7	6½	— ½
do. do. do. 3½ Deb.	81½	80	—2½
South London	3 1/16	3	—
South Metropolitan Pref.	1½	1⅜	—
Westminster Ordinary	8⅝	8⅜	— ¼
do. 4½ Pref.	5⅜	4⅜	—

HOME RAILS.

Central London, Ord. Assented	83	79	—
Metropolitan	37½	32	— ½
do. District	21½	18½	— ¼
Underground Electric Ordinary	2⅜	1⅝	+ 1/16
do. "A"	7/6	6/-	—
do. Income	88	88	+1½

TELEGRAPHS AND TELEPHONES.

	Mean price. July 27.	Jan. 26, 1915.	Rise or fall this week.
Anglo-Am. Tel. Pf.	108¼	105	+1
do. Def.	28	22⅝	— ⅛
Chile Telephone	7⅜	7⅛	—
Constantinople Tel.	4¼	3⅝	—
Cuba Sub. Ord.	8⅝	8⅜	—
do. Pf.	16⅜	15½	—
Eastern Extension	12⅝	12½	+ ⅛
do. 4 Deb.	97⅛	94	—
Eastern Tel. Ord.	130½	127	—1
do. 3½ Pf.	77⅛	71	—
do. 4 Deb.	96⅛	95	—
Globe Tel. and T. Ord.	11¼	10	—
do. Pf.	12⅝	11⅜	—
Gt. Northern Tel.	32½	28	—
Indo-European	59	55	—2
Marconi	1 15/16	1⅞	—
New York Tel. 4½	101	97	—
Oriental Telephone Ord.	2 5/32	2	—
do. Pf.	1 3/32	1 1/16	—
Tel. Egypt Deb.	98	97½	—
United R. Plate Tel.	6⅜	6	—
do. Pf.	5⅛	5	—
West India and Pan.	1½	1½	—
Western Telegraph	13⅝	13	—
do. 4 Deb.	96½	95½	—

FOREIGN TRAMS, &c.

Anglo-Arg. Trams, First Pf.	4⅞	4⅝	— ⅛
do. 2nd Pf.	4⅝	4	— 1/16
do. 4 Deb.	91	85	—1
do. 4½ Deb.	98½	94	—
do. 5 Deb.	96	88	—1
Brazil Tractions	66	68½	+1
Bombay Electric Pf.	11⅞	10½	—
do. 4½ Deb.	96	93	—2
Mexico Trams.	70	40	—
do. 5 per cent. Bonds	84	60	—10
do. 6 per cent. Bonds	76	55	—10
Adelaide Sup. 6 per cent. Pf.	5⅛	5⅛	—
do. 5 Deb.	104	101	—

MANUFACTURING COMPANIES.

British Westinghouse Pref.	1⅞	1⅞	— 1/16
do. 4 Deb.	74½	70	—2
do. 6 p lien	102½	98½	—
Callenders	11⅛	11⅛	—
do. 5 Pref.	5⅛	4⅝	—
do. 4½ Deb.	98½	98	—
Castner-Kellner	2⅝	8¼	+ 1/16
Edison & Swan, £3 pd.	2 3/32	12/-	—6d.
do. do. fully paid	1½	2⅛	—
do. do. 4 Deb.	59	60	—
do. do. 2 Deb.	63½	60	—
Electric Construction	1 3/32	11/6	+6d.
do. do. Pf.	1 1/16	1	—
Gen. Elec. Pf.	10⅞	10	—
Henleys	15	13½	—
do. 4½ Pref.	5	5	—
do. 4½ Deb.	100½	97	—
India-Rubber	9	8½	—
Telegraph Con.	38½	36	—

The Home Railway market is passive, awaiting dividend announcements. The first of these come this week, and the market anticipation seems to be that distributions will be at levels a shade lower than those of a year ago. There is, however, such wide scope for surprise that no one feels anxious to speculate on dividend chances, so the attitude adopted is a waiting one. In years gone by there used to be lively speculation in dividends; and to such an extent did the gambling run that the Committee of the Stock Exchange passed a rule, which still holds, forbidding transactions in dividends. Prices of the Underground group are a little easier on the week, with the exception of the Underground Electric Railways issues, which are rather firmer.

Of Foreign issues, Brazilian Tractions have recovered, in consequence of the declaration of the usual quarterly dividends on the common stock, noted here last week. The Rio exchange moves erratically, and, swinging with it, the prices of all Brazilian securities rise and fall. The Mexican group is very weak. Mexican Tramway bonds have fallen heavily. It looked a few days ago as though the United States were about to intervene, and put a stop to the intolerable state of affairs prevailing in Mexico; but this has not fructified, and affairs in the Southern Republic are as chaotic as ever.

Anglo-Argentine Trams have gone back, in sympathy with most of the other securities connected with the country, which has suffered so severely from floods that every industry—especially that of the railways—must be affected. The embargo laid by our own Treasury upon fresh issues of capital is another factor which may operate to the detriment of such a company as the Anglo-Argentine Tramways, the very hugeness of which implies the necessity for periodical capital outlays.

In the Manufacturing group, interest centres mostly upon Armament shares. Vickers, Armstrongs, B.S.A., and Projectiles make a quartet in the shares of which great activity prevails in the Stock Exchanges of London and the Northern provinces. The prudent holder, noting the sharp advances of the past fortnight, and realising that no small amount of the huge profits being earned by the companies must be applied to erection of new plant and machinery before anything sensational can be expected in the way of dividends, will probably recognise the wisdom of selling part of his shares now, especially if he can take a reasonably good profit. The companies dealing with chemicals, too, are prospering greatly. Castner-Kellners have risen to 3⅛.

The Electrical Manufacturing shares have gone back here and there, though the declines are small; Electric Constructions furnish an exception, with a sixpenny rise to their credit. The Rubber share market is firm, and the strength of the raw material affords justification for the investment purchases that are going on in the Throgmorton Street and Mincing Lane exchanges. The provinces, too, are taking something of a hand in this market; and any sales which might otherwise emanate from Belgium, and so check improving prices, are avoided by the Treasury restrictions, to which reference has been already made.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING DECEMBER, 1914.

WITH the present return, we bring to a close our monthly record of electrical exports and imports for 1914.

Following the prevailing tendency to which we refer elsewhere, the value of the electrical exports shows a further falling-off as compared with the previous month, the total being for December £290,069, as against £349,254 for November. This drop in value occurred in all the principal lines, such as machinery, cables, telegraphic and telephonic material, lamps, &c.; but the returns show an increase under the miscellaneous headings of goods fittings, &c., and for battery exports as compared with the previous month.

The imports of electrical goods, on the other hand, have shown a rapid recovery to normal values, reaching a total of £261,303, as compared with £201,569 in November, and monthly averages in 1914 of £230,600, and in 1913 of £245,500.

The increased imports are fairly well distributed, but particularly marked in the machinery, cable, telegraphic and telephonic sections. As regards the latter, it may be noted that Canada appears as an importer of some £19,000 worth of telegraphic and telephonic apparatus.

The re-exports, at £25,510, compared with £29,447 in November. Our most prominent customer during the month was Argentina, with whom electrical trade has apparently not suffered to the same extent as in other markets. Turning to the importers into this country, the U.S.A. has increased its last month's big total of business, reaching in December a value within a few thousands of the highest ever reached by Germany; Italy also expanded her usual trade value in December, while Dutch lamp imports have more than trebled her usual business during the past few months.

On the following pages we reproduce a series of curves for the whole year, based on these monthly statistics.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Destination of exports and country consigning imports.	Electrical goods and appliances.	Wires and cables rubber and other insulations.	Electric lighting fittings and accessories.	Electric glow lamps.	Electric arc lamps and lamp parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	1,283	3,535	735	181	58	1,386	4,090	30	247	47	596	88	12,276
Germany	...	...	...	...	...	...	...	...	...	...	...	...	...
Netherlands, Java and Dutch Indies ...	177	2,682	140	12	37	88	429	791	114	26	269	113	4,878
Belgium	...	178	...	...	7	...	...	...	...	8	...	3	196
France	399	...	133	37	...	...	2,218	14	860	60	628	7,398	11,747
Portugal	100	91	2	55	8	467	777	...	7	13	132	61	1,713
Spain, Canary Isles and Spanish N Africa...	38	156	63	33	24	69	4,414	9	35	371	215	125	5,550
Switzerland, Italy and Austria-Hungary ...	10	7	152	...	...	489	1,151	...	186	123	...	9	2,127
Greece, Roumania, Turkey and Bulgaria ...	6	7	50	14	...	...	117	...	5	...	1,311	971	2,481
Channel Isles, Gibraltar, Malta and Cyprus...	214	...	5	37	...	...	137	...	39	...	11	116	559
U.S.A., Philippines and Cuba	198	302	64	348	25	37	817	6	40	68	...	...	1,905
Canada and Newfoundland	207	1,533	237	1,024	...	943	4,571	150	822	2	340	650	10,479
British West Indies and British Guiana ...	181	7	31	125	15	...	208	...	49	14	43	28	701
Mexico and Central America	20	...	...	44	18	...	447	246	9	7	253	15	1,059
Peru and Uruguay	344	1,511	66	30	6	16	1,653	...	3	221	278	19	4 147
Chile	...	40	145	229	7	11	96	9	5	8	...	74	624
Brazil	111	1,099	137	115	63	...	3 732	757	130	3	7	44	6,198
Argentina	10,702	2,552	15,384	925	189	...	16 365	3,175	292	...	138	4,357	54,076
Colombia, Venezuela, Ecuador and Bolivia...	70	350	...	134	...	57	514	...	18	2	792	45	1,972
Egypt, Tunis and Morocco	181	73	186	30	7	...	2,429	13	14	10	402	16,288	19,633
British West Africa	57	99	61	35	14	32	261	68	35	...	56	212	927
Rhodesia, O.R.C. and Transvaal	1,161	1,543	465	802	...	140	4,355	35	39	...	45	...	8,583
Cape of Good Hope	697	3.141	348	202	2	194	1,609	16	344	6	51	534	7,144
Natal	422	2,330	279	130	2	56	114	...	50	...	67	131	3,581
Zanzibar, Brit. E. Africa, Mauritius & Aden	189	53	9	13	2	...	115	16	8	...	10	87	502
Azores, Madeira and Portuguese Africa ...	34	271	74	9	8	48	373	...	8	22	...	83	930
French African Colonies and Madagascar ...	35	22	148	5	...	...	22	...	...	...	8	11	241
China and Siam	376	429	285	17	...	567	1,902	471	61	138	1,042	95	5,383
Japan and Korea	92	8	31	48	...	616	3 273	...	183	63	40	501	4,855
India	1,565	7.542	1,591	960	43	571	14,072	3,981	4,165	42	1,333	110	35,975
Ceylon	186	383	437	...	...	108	102	30	423	177	...	1,736	3,582
Straits Settlements, Fed. Malay States and Sarawak	1,143	266	123	22	18	86	5,404	247	69	104	184	361	8,027
Hong Kong	7	139	373	27	51	74	486	...	8	11	120	...	1,296
West Australia	68	376	9	239	16	45	1,747	40	8	...	...	...	2,548
South Australia	183	246	345	108	51	300	238	835	129	...	150	...	2.585
Victoria	1,911	6,792	984	460	6	535	2.378	261	163	81	3,430	2.606	19,607
New South Wales	962	2,624	848	659	57	27	7,104	1,122	9,446	7	1,349	1,081	25,285
Queensland	222	1,597	218	54	...	475	492	...	151	...	191	...	3,400
Tasmania	28	98	...	...	...	...	519	...	9	...	...	...	654
New Zealand and Fiji Islands	1,033	3,579	1,305	875	...	658	3,188	529	270	...	864	302	12,539
Total, £	24,612	45,661	25,463	8,038	734	8,095	91,919	12,851	18,465	1,634	14,343	18,254	290,069

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Russia, Norway, Sweden and Denmark ...	71	...	...	10	637	22	1,722	163	2,332	...	4,575	9,532
Germany	...	...	...	...	...	...	...	...	...	...	...	...
Holland...	26	1,744	...	5,036	1,535	...	187	...	349	...	87	8,964
Belgium	...	...	...	...	...	...	10	...	...	...	...	10
France	68	282	615	...	286	48	...	...	1,681	3,104	890	6.974
Switzerland	473	6,424	...	477	178	1,918	2,188	...	30	1,318	10	13 016
Italy	2,231	6,292	9	...	37	139	26,779	711	590	20	...	36,808
Austria-Hungary	...	...	...	...	...	...	...	...	...	...	...	...
United States	9,265	1,187	1,015	931	3 253	440	19,065	44.716	3,678	4,282	6 035	163.867
Total, £	12,134	15,929	1,639	6,454	5 926	2.567	79,951	85 590	8 660	8,724	11,597	239,171

Additional imports: Portugal: Instruments, £10. Spain: Lamp parts, £71; carbons, £2 193. Canada: electrical goods, £831; meters, £28; telephone and telegraph apparatus, £18,999.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

Various countries, mainly as above... ...	11,503	...	...	104	18	...	6,904	...	49	525	7,407	25,510

TOTAL EXPORTS: £290,069 TOTAL RE-EXPORTS: £25,510 TOTAL IMPORTS: £261,303

NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third column contains many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns. Imports are credited to the country whence consigned, which is not necessarily the country of origin.

ELECTRICAL EXPORTS AND IMPORTS DURING 1914 AND PREVIOUS YEARS.

THE year 1914 will be indelibly impressed on the memories of most of us because of its unfortunate association with the present European war, which great as it is in extent, in the numbers engaged and interests involved, shows an unmistakable tendency to spread still further. The withdrawal of the wealthiest industrial nations of Europe from their normal occupations, and the interference with, and diversion of, the business of so many adjoining, though neutral countries, has naturally played havoc with the European electrical industry as a whole, though we are glad to think that the British share in particular has not suffered so severely as might have been expected.

It is necessary to emphasise the fact that this is an "engineering" war, and the demands on us for engineering material for the allied armies on a war footing are such that the manufacture of war material has replaced—no doubt profitably—the normal employment of a large percentage of engineering and even electrical firms, and in the case of the latter a considerable proportion of this normal business—particularly for the home market—has passed to such overseas sources of supply in neutral countries as are available, with the result that the imports of electrical material have shown a rapid recovery to last year's level since August, while British electrical exports, though substantial in amount, show a falling off, which will probably become more marked while our firms are situated as at present.

These features are reflected in the curves which—as usual in January—we reproduce as a convenient summary of the past year's business. Thus in our first set of curves, fig. 1, the total electrical exports from this country (heavy curve) show a decided falling off during the early part of the year prior to the war—the tendency in this direction being mentioned in our last annual résumé. Then came the slump—common to all the curves—which occurred soon after the outbreak of war, and was followed by a partial recovery in business.

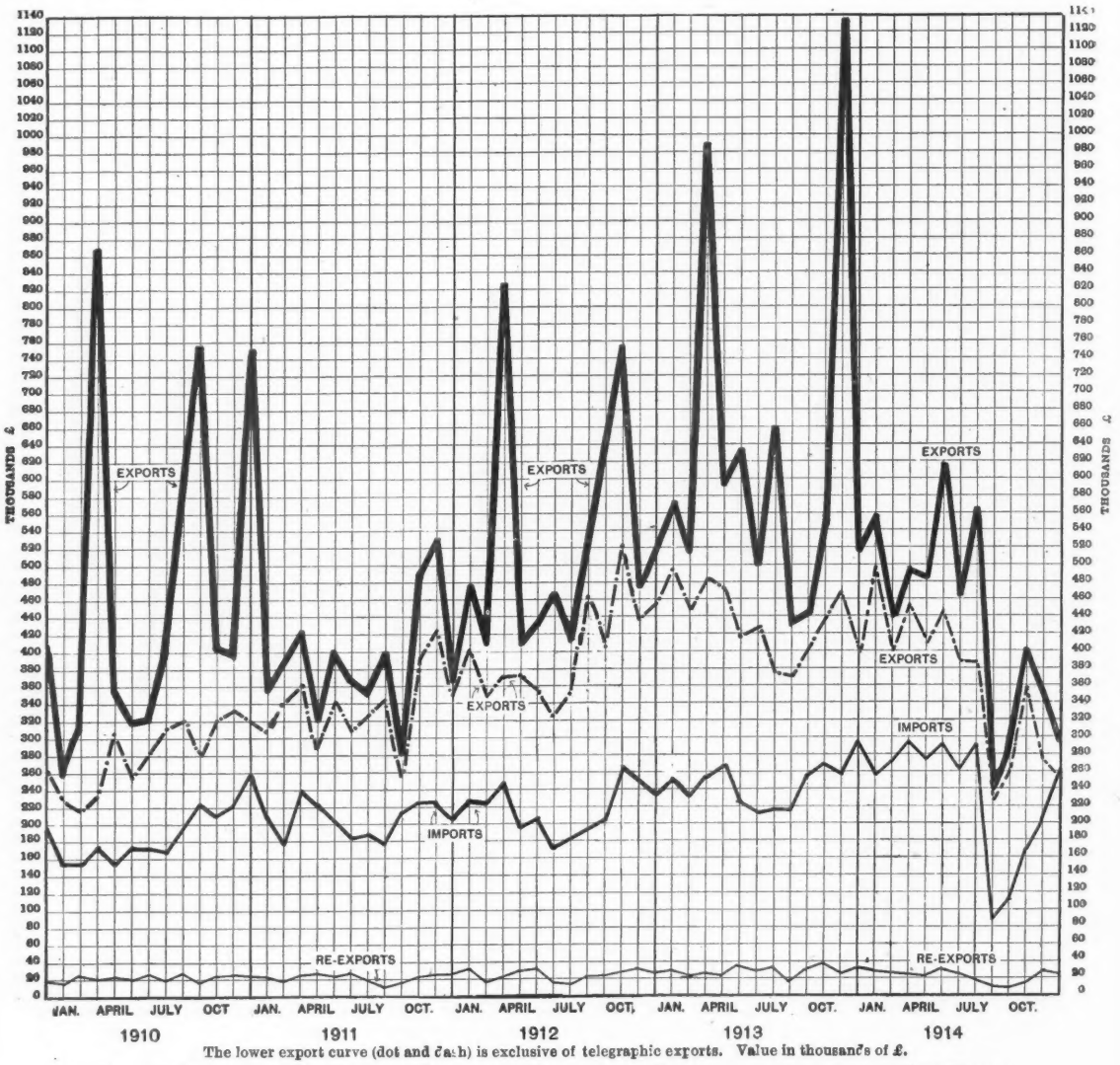
No large telegraphic export occurred during the year, but the general export business (dot and dash curve) remained fairly steady at a reduced level during the first six months of the year. In contrast to this the imports remained steadily at a higher level than they have ever previously reached during the first half of 1914, which reference to our last set of curves, fig. 7, will show to be due to the combined efforts of American and German importers, but more especially the latter.

The re-exports, comparatively small in amount, have returned to something like pre-war level.

The gross values of our electrical exports and of the telegraphic material included therein, for the five years included in the curves, were as follows:—

1910	Gross	£5,700,000	.....	Telegraphic	£2,267,500
1911	,,	£4,600,000	.....	,,	£560,000
1912	,,	£6,300,000	.....	,,	£1,500,000
1913	,,	£7,568,000	.....	,,	£2,388,000
1914	,,	£5,189,000	.....	,,	£835,800

The monthly average of general business, shown by the dot and dash curve, was, for 1910, £286,000; 1911, £338,000; 1912, £400,000; 1913, £432,000; and 1914, £362,000, but during the first half of the latter year the monthly average was the same as in 1913.



The lower export curve (dot and dash) is exclusive of telegraphic exports. Value in thousands of £.

FIG. 1.—CHART SHOWING MONTHLY ELECTRICAL EXPORTS AND IMPORTS DURING THE PAST FIVE YEARS.

As regards the imports of electrical material into this country during 1914, the total value shown by our statistics was £2,767,000, representing a monthly average of roughly £230,000, these figures comparing with £2,946,500 and £245,500 in the previous year (1913). Although the past year, as a whole, naturally shows a falling off in values, it should be noted that the first half of the year showed record imports, viz., a monthly average of £275,000.

The re-exports for 1914 were valued at £265,200, or a monthly average of £22,000, as compared with £341,000 and £28,000 respectively in 1913.

Our second set of curves, fig. 2, shows the trend of machinery and cable exports during the past five years, and it will be seen that during the early part of 1914 machinery export values

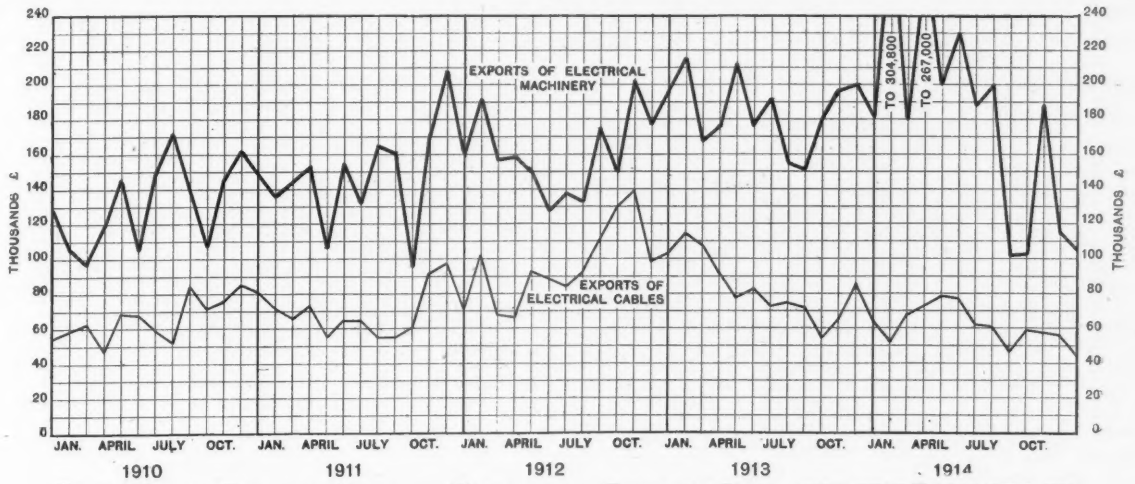


FIG. 2.—MONTHLY EXPORTS OF ELECTRICAL MACHINERY AND ELECTRICAL CABLE—OTHER THAN TELEGRAPHIC AND TELEPHONIC CABLE—DURING THE PAST FIVE YEARS.

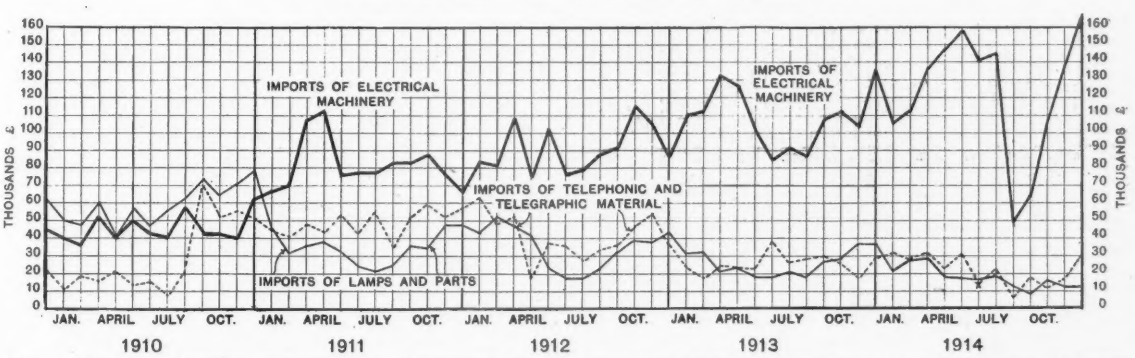


FIG. 3.—MONTHLY IMPORTS OF ELECTRICAL MACHINERY, TELEGRAPHIC AND TELEPHONIC MATERIAL AND CABLE, AND ELECTRIC LAMPS AND PARTS DURING THE PAST FIVE YEARS.

attained record proportions, averaging, in fact, during the period January—June, some £224,000 per month, and over the whole year £179,500 per month, the comparative figure for 1913 being £184,000. The total value of the machinery exports for 1914 was £2,154,000, as compared with £2,209,200 for the previous year.

Cable exports, shown in the lower curve, have declined during the past two years and—it may be some consolation—appear to have suffered to a trifling extent in the early days of the war.

The cable exports for the year—not including telegraphic or telephonic cables which are included elsewhere—reached a total value of roughly £741,000, as compared with £968,000 in the previous year.

Curiously enough machinery imports, shown in fig. 3, also attained record values during the first half of 1914, and their rapid recovery in value since the war leaves them in December at the highest level yet reached.

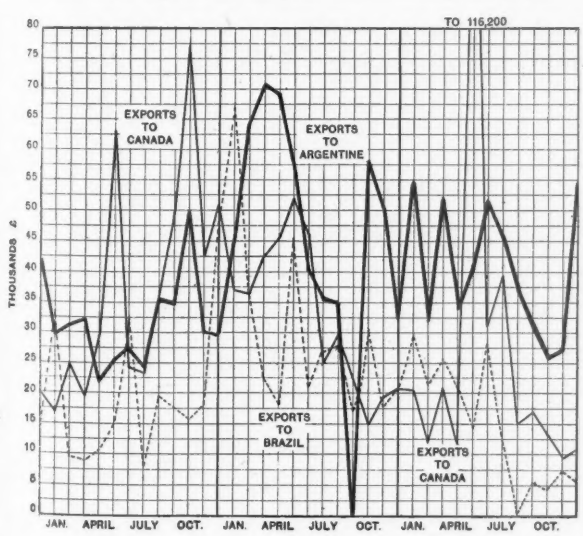
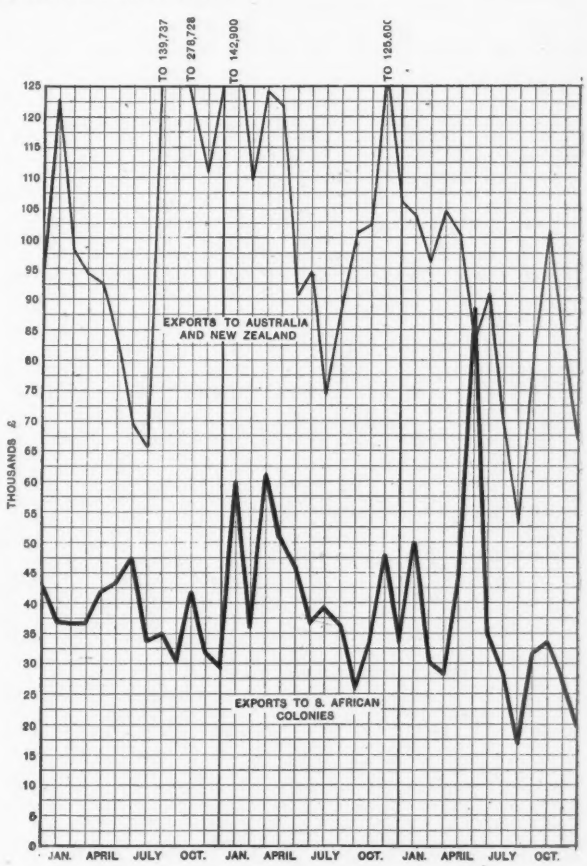


FIG. 4.—ELECTRICAL EXPORTS TO CANADA, ARGENTINA AND BRAZIL, 1912-14.



Upper curve includes New Zealand, Australian States, and Tasmania. Lower curve includes Cape, Natal, Transvaal and Orange River Provinces and Rhodesia.

FIG. 5.—ELECTRICAL EXPORTS TO AUSTRALASIA AND SOUTH AFRICA, 1912-14

Other curves in fig. 3 indicate a continuous falling off in the importation of lamps and parts, which although no doubt largely due this year to the shutting off of German supplies, has been in evidence since 1910, and a similar falling off in telegraphic and telephonic imports.

Electrical machinery imports totalled £1,476,000, imports of telegraphic and telephonic material £267,500, and of lamps

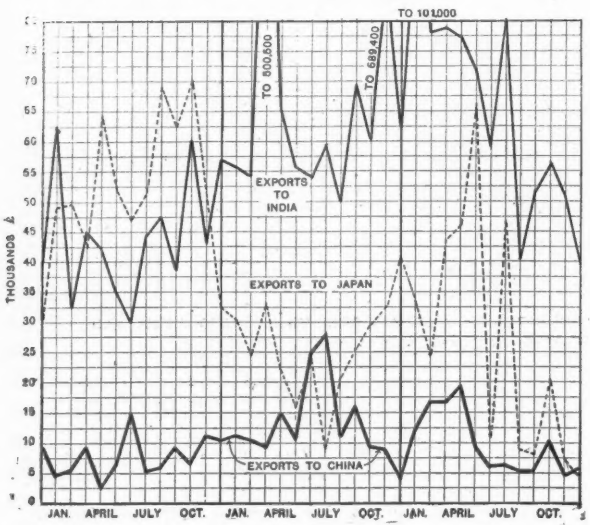


FIG. 6.—ELECTRICAL EXPORTS TO JAPAN, INDIA AND CHINA, 1912-14.

and parts, £215,000, during the twelve months. These figures compare with £1,300,000, £314,000 and £313,000 for the same items respectively in 1913.

Purchasing Countries and Importers into the United Kingdom.

Of the remaining curves, those in figs. 4, 5 and 6 show three years' business with some of our principal customers, with all of whom trade sustained a severe shock on the outbreak of war. Fig. 4 shows that Argentina was our best customer on the American continent, business in that direction being fairly well maintained despite the war. Brazilian trade, which has been declining for the past two years, has dropped off to insignificant proportions since the war, while Canadian trade, with the exception of one or two spasmodic jumps, has been at a lower level than in the previous year.

The curves given in fig. 5 of electrical exports to Australia and New Zealand, and our South African colonies, indicate the same general falling off in values over the year as compared with 1913, with a marked kink at the outbreak of war.

Fig. 6, dealing with Far Eastern trade, shows that with both India and Japan our electrical business was in a really flourishing condition during the early part of the year—especially so in the case of India, with whom trade has been rapidly increasing for some years—and even Chinese trade showed hopeful signs. In all these cases values tumbled down in August, and while we still retain a reduced though substantial Indian business, and the gross value of exports to Japan during the year was actually higher than in 1913, yet at the present time both Japanese and Chinese business appears to be at a very low ebb.

The gross values of our export business to the countries abovementioned for the years 1913 and 1914 were as follows:—India, £1,769,000 and £784,000; Australia and New Zealand, £1,283,000 and £1,032,000; Argentina, £558,000 and £488,000; South Africa, £508,000 and £434,000; Canada, £392,000 and £318,000; Japan, £309,000 and £320,000; Brazil, £350,000 and £176,000; and China, £159,000 and £117,000.

The last series of curves, fig. 7, dealing with prominent importers into this country, which have become almost monotonous by reason of the overbearing position of Germany, will be reviewed this year with unusual interest.

Germany did a bumper trade with us during the early part of the year, whether due to accident or design, we can leave to our readers, but following the outbreak of war this naturally fell away to nothing in September, since when there have been no official records of "German" material entering this country. But our American cousins, who in the previous year were showing an increasing interest in our markets, have taken up the running, and are now sending into this country an even greater value of electrical material than Germany did. Under existing conditions this development is not surprising, America being the only really free electrical manufacturing nation at the present time; indeed, her freedom in this respect may be a matter for congratulation to us under the circumstances.

It may be of some interest to record that according to our monthly returns, Germany sold to us magnetos to the value of over £240,000 during the first seven months of the year; the total value of her electrical imports into this country during this period and a few extra days in August amounted to some £1,133,000, or a monthly average—taken over seven months—of £162,000, as compared with £1,632,000 and a monthly average of £136,000 during the previous twelve months. From the States we purchased electrical material to the value of some £911,000, a monthly average of nearly £76,000, as compared with a total of £593,000 and monthly average of over £49,000 in 1913.

Of the other countries, the Belgian curve shows that her trade has also dwindled to nothing, while France still maintains some small business with us. On the other hand our monthly statistics show that Italy, Switzerland and Holland—neutral countries only partly affected by the war, have increased their business with us since August; the Dutch lamp industry, in particular, has found a market in this country, as also have Swiss and Italian cable, etc.

The electrical imports for the last five months of the years 1913 and 1914, for the Scandinavian countries, Holland, Switzerland and Italy were valued as follows:—1913, £83,000; £14,800; £28,000; and £42,000 respectively; 1914, £52,610; £47,000; £34,000 and £50,000 respectively. The Scandinavian total for 1914 shows a decrease, but Russian business, which was included in the 1913 total, has of course disappeared since the war started.

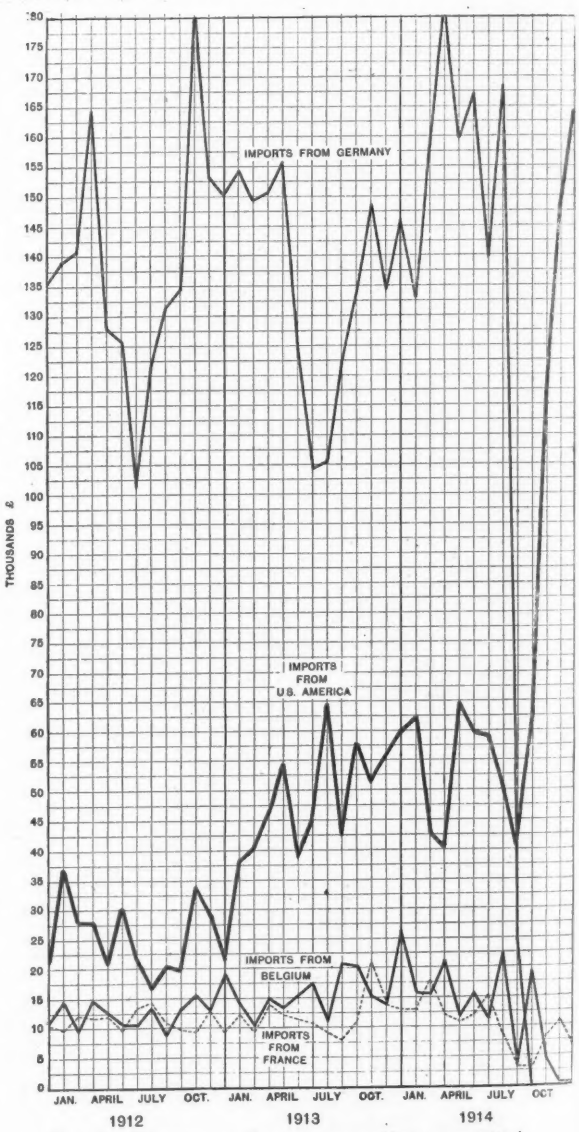


FIG. 7.—ELECTRICAL IMPORTS FROM GERMANY, U.S.A., BELGIUM AND FRANCE, 1912-14.

General.

In concluding these notes, we may point out that the falling off in electrical export business which was indicated in our 1913 curves, continued during the year under review up to the time of the war, and the latter has only been an additional factor in the result. Through the general obscurity in which the future is necessarily veiled, it is not easy to see any improvement in our export business, the indications being that a shortage of both labour and available plant will tend to a further falling off in this direction, as greater numbers of

troops become engaged. And for similar reasons it would seem probable that electric imports from America, in particular, which at any rate has ample copper supplies, will show a corresponding increase, for it will be her object to make up for the shortage of European importation into this country as well as any deficiency in the usual supply of material by British firms to the home market, in so far, of course, as these are not curtailed by the war.

It is, in fact, obvious that self preservation may necessitate our concentrating on war requirements to the exclusion, if necessary, of foreign trade, and it is a matter for congratulation that such drastic measures have not up to the present been necessary.

CAB SIGNALS ON BRITISH RAILWAYS.

(*Abstracts of Papers read before the* INSTITUTION OF MECHANICAL ENGINEERS, *December 18th*, 1914.)

(*Concluded from page* 126.)

G.W.R. Automatic Train Control and Audible Signal System.

BY W. A. STANIER, ASSISTANT MANAGER, G.W.R. LOCOMOTIVE WORKS, SWINDON.

About the year 1905 some of the Great Western engineers devised an audible signal for the locomotive cab, which, after a certain amount of experimenting, was considered to be simple enough and certain enough to warrant a more extended trial. It was agreed to equip certain branch lines with the apparatus, and as a result the system has had certain improvements, and its use has been considerably extended.

A fixed ramp, in the centre of the track, about 400 yards before the DISTANT signal is reached, is connected to the lever in the signal-box controlling this DISTANT signal by means of an electric wire and switch with a battery in the circuit.

The ramp is laid on the skew so as not to wear a groove in the shoe, and to assist in clearing it, and the shoe which rubs on it, of anything such as frost or snow which tends to insulate them from one another.

In the signal-box is a switch connected to the ramp with a battery of about eighteen Leclanché cells in the circuit, with an earth return. This switch is attached to the lever controlling the DISTANT signal, so that the ramp is electrified when the signal is at PROCEED and dead when the signal is at STOP. The ramp is therefore dead in the event of the battery or connections becoming faulty.

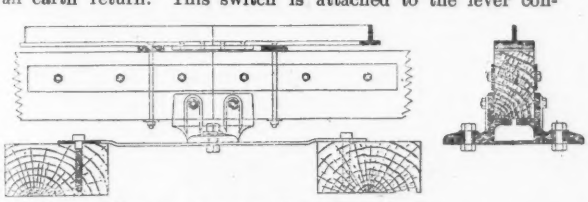


FIG. 2.—CENTRAL PORTION OF RAMP.

The apparatus on the engine consists of a siren and brake-valve, and an automatic steam switch. The contact-shoe is fixed in the centre line of the engine, and projects to within 2½ inches above rail level. It is lifted 1½ inches whenever a ramp is passed over, opening a switch attached to the contact-shoe.

The switch is connected with the electrically-controlled brake-valve and siren in such a way that whenever it is opened, except as hereafter described, air is admitted through the siren and brake-valve to the train-pipe, sounding the siren and applying the brakes on the train, figs. 3 and 4. This happens when an engine passes over an unelectrified ramp. The driver can stop the siren sounding, and stop the application of the brakes by raising a handle provided for the purpose, and thus acknowledges the audible STOP or DANGER signal given by the siren. Should the signal be in the PROCEED or ALL-RIGHT position, fig. 5, the switch connected to the lever in the signal-box working this signal is closed, and the ramp is electrified, so that when the engine passes over the ramp, the shoe picks up the current, closing a secondary circuit on the engine which prevents the brake-valve from opening, and at the same time causes the bell on the engine to ring. This audible ALL-RIGHT signal continues until the engineman presses a push-button on the side of the cab apparatus, thus acknowledging the signal, and by breaking the bell circuit stops the bell ringing.

The cab apparatus consists of a box mounted on the side of the cab close to the engineman. It contains an electro-magnet, energised from a small accumulator on the engine, which holds up an armature. The armature is integral with the lever that controls the brake-valve and siren. Close to it is a steam-switch. Its object is to cut out automatically the electric battery on the engine, so that when the engine is not in steam the circuit is open and waste of current is prevented. It is arranged with a diaphragm which is set to move with about 40 lb. steam-pressure, and when it moves it joins up the circuit in the engine. A selective or polarised relay controls the secondary circuit, which circuit is primarily used for ringing the bell mounted at the top of the box, which gives the ALL-RIGHT signal. This relay is also used when the apparatus is installed on single lines. When a train is going in one direction on a single line it is necessary that the ramps controlling signals in the opposite direction should give no signal. This is effected by electrifying these ramps with a current of opposite polarity. The means for doing this is controlled by the electric staff or tablet apparatus, fig. 6.

The apparatus on the engine is always tested as the engine leaves the locomotive shed, as a short ramp is fixed alongside the outgoing signal for the locomotive yard, so that the engineman satisfies himself that the device is all right before he gets to his train. The device has proved so satisfactory that about 180 miles and 90 engines up to the present have been equipped, and its use is rapidly being extended.

Signalling on Railway Trains in Motion.

BY W. WILLOX, ENGINEER, METROPOLITAN RAILWAY, LONDON.

Twenty-seven miles of the Metropolitan Railway are electrified, and 23½ miles are governed automatically by track circuits. The rest of the Metropolitan Railway has ordinary lock and block signalling, with a number of sections automatically controlled by track circuits.

The system of signalling in use on the electrified portion of the Metropolitan Railway is *all electric* automatic, and this signalling requires no visual indication in the driver's cab. There is, however, a control on the driver by means of "train-stops," which are placed at every STOP signal. The train-stop is a device which is controlled by the track circuit in exactly the same manner as the signals, and consists of a short vertical arm which is held vertically in its normal position, and is lowered to the CLEAR position by means of the track circuit acting through a motor at the same time as the signal goes to CLEAR. There is a trigger fitted on the leading motor coach or electric locomotive which would engage with the train-stop in its normal position and so be deflected backwards. When this occurs, it applies the emergency brake on the train and simultaneously opens the power circuit, thus braking the train and cutting off the current. In this way, if a driver passes a signal at DANGER, his train is automatically brought to a stand and cannot be started again until the trigger is replaced in the vertical position. As showing the effect of these train-stops, it may be mentioned that a train weighing 200 tons running at a speed of 25 miles per hour on the level is brought to a stand in less than its own length.

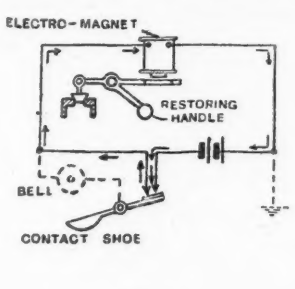


FIG. 3

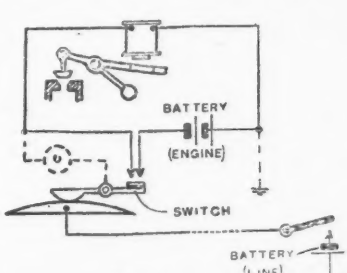


FIG. 4.

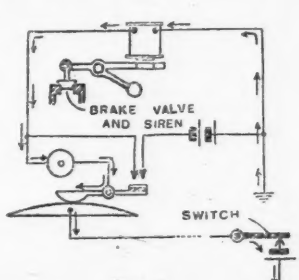


FIG. 5.

CIRCUIT DIAGRAMS OF G.W.R. SYSTEM OF TRAIN CONTROL.

These train-stops, although they come to a CLEAR position at the same time as the signals, are controlled by the track circuit independently of the signals, so that if by any accident the signal should remain at the CLEAR position instead of going to DANGER, the train-stop would still go to the vertical position and thus come into action if the train went past the signal.

The control for the train-stop mechanism is complete when the respective track-section is unoccupied, and is in shunt with the signal control. After the train-stop motor has finished its work, that is, bringing the train-stop arm to the CLEAR or inoperative position, the motor circuit is opened automatically by means of the motor control. The train-stop is then held in the CLEAR position electrically by means of a clutch (as shown

on plan). The motor only operates for the actual clearing, and the clutch arrangement reduces the power for holding at CLEAR to an almost negligible quantity, 1-10 amp. When the power circuit is broken, the only moving part of the apparatus

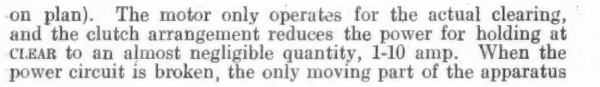

Contact on lever controlling signal for direction of running.
Contact in Electric Tablet Instrument, electrifying Ramp so as to produce no signal on engine. Contact made only when Tablet is out for train to proceed in opposite direction.
RAMP

FIG. 6.—WIRING ON SINGLE-LINE RAILWAY.

is the train-stop arm and shaft, the motor remaining stationary, this being effected by the clutch mechanism. The voltage of operation is 60 and the power required for clearing about 30 watts, the time taken being five to six seconds.

Fig. 7 shows the general arrangement of the train-stop

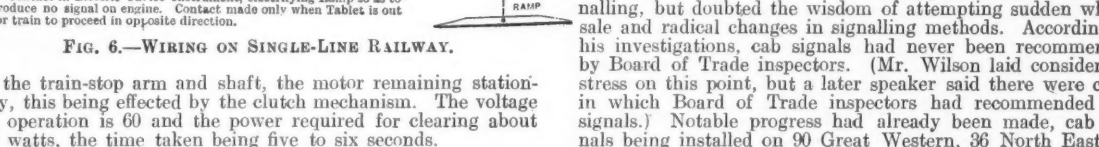


FIG. 7.—TRAIN STOP, METROPOLITAN RAILWAY.

and controlling motor at rail level, and fig. 8 is a diagram of the wiring between the track circuit and the motor, showing how it is controlled.

With regard to the reliability of the train-stops described, the results are very satisfactory, as there have been many cases of drivers running past the signal, either through carelessness or some failure of the apparatus, being pulled up by the train-stops.

As to its usefulness, it is relied on to such an extent that fog-signalling in some cases has been dispensed with. Further,

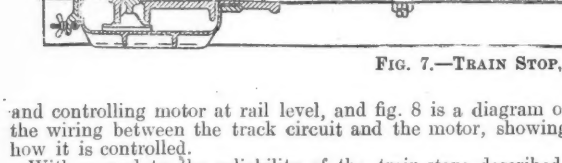


FIG. 8.—DIAGRAM OF TRACK CIRCUIT AND MOTOR CONTROL.

it has been possible to shorten the signal sections, and this shortening has only been agreed to by the Board of Trade on condition that train-stops are provided, and the Board of Trade also requires that all STOP signals on the electrified lines shall be fitted with the train-stop apparatus.

DISCUSSION.

In opening the discussion, the CHAIRMAN (Mr. Michael Longridge) said that the subject of cab signalling was of enormous importance, as the ordinary system of semaphore signalling left much to be desired. He suggested that audible signals were always more reliable, and that the efforts of engineers should be directed to perfecting a system of audible cab-signalling.

Mr. A. T. BLACKALL (Chief Signal Engineer, G.W. Rly.) attached special importance to automatic brake application in the event of the signal being at danger; with this system, there was no need for visual signals. Uniformity of system was of the utmost importance; in particular, an engine belonging to railway A should be able to pick up signals on railway B when running over the latter. He agreed that there should be no moving parts in the track equipment for cab signalling. On high-speed lines in particular, it was unsafe to depend on the train hitting a stop moved from a signal-box say half a mile away.

Mr. S. L. GIBSON (Toronto) outlined a Swiss system of signalling and train dispatching (*i.e.*, control from a central office) with which he had had experience in the States. The system was in regular use on 130 miles of track with extensions in progress to 250 miles. A fixed ramp and shoe were used, visible as well as audible signals being given in the cab. Following usual American practice, a green light, *i.e.*, "safety" signal, was shown normally, a red light appearing only between the distant and home signals when danger was present. The ramps were connected to the control station, and in the latter was a record sheet—showing time horizontally and number of "blocks" vertically—on which every train on the system recorded its position accurately and automatically. Only in exceptional cases were trains stopped automatically. In general, control was restricted to automatic speed limitation within predetermined limits: this speed control could not be overcome by the driver. The automatic apparatus was set in operation at the distant signal, and if the driver did not reduce speed within a certain distance, the automatic apparatus took charge of the train; it did not come into operation if the driver kept within the speed limit applicable to the case. A maximum speed limit was enforced in similar manner, and in the event of a signal being at danger, speed was reduced automatically to say 5 m.p.h. Ramps in and at the entrance to curves secured automatic speed limitation therein. This system had been used satisfactorily for some years; the General Railway Signal Co. (Rochester and New York) was to use it in re-signalling the Metropolitan Railway (New York) and the Pennsylvania Railway was about to use it on 20 miles of four-track way.

Mr. H. RAYNAR WILSON was strongly in favour of cab signalling, but doubted the wisdom of attempting sudden wholesale and radical changes in signalling methods. According to his investigations, cab signals had never been recommended by Board of Trade inspectors. (Mr. Wilson laid considerable stress on this point, but a later speaker said there were cases in which Board of Trade inspectors had recommended cab signals.) Notable progress had already been made, cab signals being installed on 90 Great Western, 36 North Eastern, and two Midland locomotives, but to avoid unnecessary expense and to reduce the difficulty of securing ultimate uniformity of working, it was desirable to proceed slowly—first repeating distant signals efficiently, then adding stop and route signals later.

Mr. J. SAYERS (Midland Railway) pointed out that, however useful "train stops" might be on low-speed lines, they were of no value for high-speed steam or electric traffic. In his opinion several recent accidents on the Interborough and Third Avenue Railways could only be attributed to failure of train stops. Allowance must be made for the fact that more or less main-line track would ultimately be electrified, and he believed that it would be found there was no room on the track for signalling apparatus. At present single-phase overhead traction utilised running rail return, but the speaker believed that the Board of Trade here and the Public Safety Commission in the States would soon insist on a special return circuit being provided, in which case ramp systems of cab-signalling would have to find another means of transmitting signals to the engine. In co-operation with Mr. Acfield he had tried, on the Midland Railway, a wireless system based on the Railophone and operating, through a tuned relay, an audible indicator and the train brake. He submitted that the continuity of visible signals as now used made them ideal if only one could ensure that they could always be seen.

Mr. A. D. JONES (S.E. and C. Rly.) asked whether risk was not incurred by the normal position of the indicating arm being "clear" in the North Eastern system of cab-signalling; and by the driver being able to re-set the cab semaphore and switch out the bell. Did not cab signals take the driver's attention from the track? The critical period between the beginning of a fog and calling out fog-men could be tided over by some apparatus enabling signalmen to place detonators mechanically. Cab-signalling was imperfect so long as it left the possibility of errors due to signalmen, for such errors had been responsible for many accidents; also, the system should include automatic train control, though this must not be in the nature of a sudden train stop in the case of high-speed traffic. Apart from other considerations, an attempt to stop suddenly, say, a heavy goods train on a down-grade would cause trucks to mount the tender. Uniformity of system was of the utmost importance—particularly in such cases of military emergency as now existed, when through-running in every direction, all over the country, was desired.

Mr. GARNER SMITH said that in his opinion a mechanical as well as an electrical signal was necessary for safety.

Mr. R. G. BERRY (L. & Y. Rly.) announced that he had been conducting successful experiments with a system of cab-signalling giving both "all right" and "danger" signals, but requiring no battery or accumulator and no delicate contacts on the locomotive.

Mr. A. E. ROBERTS (L. & S.W. Rly.) criticised severely the practice in the North-Eastern system of mounting the brush frame on a truck, which had considerable vertical motion.

Mr. R. J. INSELL (G.W. Rly.) pointed out that the G.W. Rly. system of cab-signalling was as efficient as the N.E. Rly. system in warning drivers of their approach to a signalling zone; the G.W. system gave cab signals coinciding with the semaphore signals. Route indications were given only in the case of junctions which could be traversed at 40 m.p.h. or upwards. At most junctions the "danger" signal was given at the distant post in order that speed might be reduced for the junction; route indications were then unnecessary. Train stops were of no use on high-speed steam lines. Modern high-speed, frequent-service conditions would necessitate one system being generally adopted in the near future.

In reply, Mr. ACFIELD said that no mechanically operated moving ramp could be generally satisfactory. Tests on the

Midland Railway showed that train stops could not stand operation by trains running at 60 to 70 m.p.h. The exigencies of modern traffic demanded that the driver should be able to release himself from automatic braking directly such release became safe, and without waiting for the guard's services. Visual signals, though not necessary where distant signal control was alone practised, were advisable where the home signal was given also.

Mr. PIGG (speaking in the absence of Mr. V. L. Raven) said that an important feature of the N.E. system was the showing of one signal till the next was given. The driver was not required to remember what was the last signal. The normal position of the indicating arm was "danger," but the normal running position was "safe" so long as all circuits and contacts were in order. The cut-off switch was used only to save current while locomotives were in sheds; special ramps outside the latter demonstrated the correct working of the apparatus on leaving the sheds. The bell switch was for use in shunting; even with the bell switched out, a complete "off" signal was not given because the route indicator remained central. The complete canalisation of the system was very important, and Mr. Raven's system did not lose control of the driver at the distant signal.

Mr. W. A. STANIER said, with regard to acceleration of service by cab signals, that G.W. drivers placed implicit faith in their apparatus and ran dead to time in fogs when trains not equipped with cab signals were seriously delayed. The G.W. Rly. had also tried a purely mechanical audible cab-signalling system.

Mr. W. WILLOX said that when cab signals were sufficiently perfected no doubt they would be used on suburban electric trains. At present train stops were used as being the only means by which such a service as 42 trains per hour on one line could be maintained. In operation they had proved perfectly reliable at speeds up to 40 or even 50 m.p.h.

Mr. A. F. BOUND (G.C.R.), in a communication, expressed the view that the existing visual signals must be retained, and any new system must be merely an adjunct to present methods. It was useless to deal with the fog-signalling problem; the proper course was to provide something which would ensure that the traffic should be worked according to the indications displayed by the signals. The main thing was to prevent a train from passing a HOME signal at DANGER by fixing the control at such a distance from the signal that the train would be stopped in time.

Mr. H. W. MOORE (L. & Y.R.) wrote that the system described by Mr. Stanier appeared to meet every practical requirement, though it only gave a warning at the DISTANT signal. He thought an automatic appliance should be provided to stop the bell ringing.

Mr. J. C. SYKES thought that the driver should not be allowed too easily to liberate his brake when it had been applied automatically. The duties of the driver should not be added to; he should be allowed freedom of action until he did something wrong, and therefore he thought a properly designed train-stop was the solution of the difficulty. They were putting too much apparatus on the locomotive; the train-stop, however, was simple. The signalman ought to be provided with means to stop a train, in case of need.

THE DEVELOPMENT AND APPLICATION OF SEARCHLIGHTS.

AT a meeting of the ILLUMINATING ENGINEERING SOCIETY on January 19th, Mr. P. G. LEDGER opened an instructive general discussion on this subject, the paucity of literature relating to which was remarked and regretted by most of the speakers. After pointing out the distinction between beacons which are intended to be seen from a distance and searchlights which are intended to illuminate and reveal distant objects, Mr. Ledger stated that the electric arc was the only source having sufficient intrinsic brilliancy (200,000 C.P. per sq. in.) for high-power maritime work, though bunched incandescent filaments and the half-watt lamp were useful for locomotive headlights, fire brigade, aeroplane and other small searchlights. Searchlights were used during the last Franco-Prussian war, but with metal mirrors which suffered from distortion, corrosion and other defects. The perfection of the mirror and optical system generally was the chief improvement which had been effected in the construction of searchlights, and in this connection the work of Fresnel and Mangin must not be forgotten. The candle-power of a powerful searchlight was very indeterminate, varying as it did with the consumption of the carbons and, in effective value, with atmospheric absorption. Tests made in a clear atmosphere showed that the candle-power varied from 4,000,000 C.P. with a projector 40-cm. in diameter, using a 20-amp. arc, to 180,000,000 C.P. with a 150-cm. projector and 150-amp. arc; in the latter case, the intensification factor of the mirror would be about 4,300 and the mean horizontal intensity of the arc in the direction of the mirror about 46,000 C.P. The speaker exhibited a curve showing that increasing the input to searchlights increased the C.P. per watt at first rapidly, but then slowly; corresponding to 0.8, 1.7, 2.75, 4.9, and 9.5 kilowatts were 4, 5, 5.5, 6 and 6.5 C.P. per watt. Knowing the divergence of the beam (rarely less than 2° or 3°, nor need it be otherwise, or it would take too long to search a given area), the true centre of radiation could be determined and the law of inverse squares applied sufficiently closely to permit a fairly definite value to be assigned to the candle-power. Usually, however, the variety of carbons, current and voltage, and diameter and focal length of mirror, were alone specified. The "range" of a projector was even less definite than its candle-power. Often it was demanded that a projector should show up small objects which could not under any circumstances be seen at the distance specified. Any attempt to specify range must stipulate that the atmosphere be clear and that an object of definite size and colour be visible at a certain distance. As a rough guide, a modern 150-amp. searchlight would carry 10,000 yards in clear weather. Nerz's rule stated that the radius of action varied with the square root of the mirror diameter and the fourth root of the intrinsic brilliance of the source; this rule took no account of the size of object viewed.

The coming of aircraft had made it necessary to project beams vertically upwards for military purposes and had raised the intricate problem of arranging for flashing beacons operating in both horizontal and vertical planes. Vertical projection might be arranged by giving the projector barrel the desired inclination; by using a lens, with the arc beneath it, instead of a mirror; or by allowing light from a stationary projector to fall on a mirror capable of rotation in any plane. Yellow or red rays penetrated fog better than did blue light, and there was a possibility of increasing ranges by using coloured light; using a coloured mirror or screen would waste much light. Any improvement with a view to increasing the light available would have to be made by increasing the brilliancy of the crater; but progress in this direction must not diminish unduly the life of carbons (3 or 4 hours in large and 7 hours in small projectors.) A 100-amp. arc using a 27-mm. positive carbon might employ a 13-mm. copper-cored negative and the shadow of the latter, with a relatively long arc, was inconsiderable. Recent improvements had been in respect of rapid dismantling and easy manipulation, *e.g.*, automatic movement of the beam in accordance with the motion of an observer's telescope.

Mr. J. ECK said that we appeared to have reached the limits of performance with searchlights of the existing usual design; increased current input no longer gave appreciably more light on a distant object. A new type of lamp had recently been produced in the States having vapour-cooled electrodes placed at about 150° to each other. The positive carbon was 15-mm. in diameter and horizontal, the negative was 11-mm. in diameter and inclined. Both carbons were rotated steadily by a small motor which also served to actuate the feed and other movements in the lamp. Flat nozzles delivered methylated spirit vapour on to the carbon tips. The arc crater occupied the whole section of the positive carbon, and it was found that with lamps of this type, higher specific illumination and a more concentrated beam were obtained than from an ordinary projector of equal size. As compared with a standard projector of the same current capacity and mirror diameter, a projector with vapour-cooled arc produced 4.2 times as great average illumination along 238 ft. of arc at a distance of 6,800 ft., and 5.2 times as great illumination along 1,238 ft. of arc at a distance of 27,550 ft.

Mr. W. M. MORDEY said that there seemed to be a tendency to revert to the earliest type of arc with inclined carbons and both incandescent tips exposed. Was it not possible to use an alternating-current arc with inclined and, of course, equally heated carbons, while still keeping a small enough source for accurate focusing? At present the capacity of projectors was largely limited by heating; possibly it would be worth while to water-cool the barrel and mirror.

Mr. LYON said that oxy-petrol burners incandescing a refractory button permitted the construction of very portable self-contained searchlights. For aeroplane use a swivelling searchlight of 2,000 intrinsic candle-power weighed 60 lb. complete with generator, automatic field regulator (compensating for variations in engine speed) and ballast resistance. A Fresnel lens was used and a sheet of plane glass prevented ash dropping on to the mirror. A half-watt signalling lamp with a specially efficient optical system, for aero-work, was also described. A metal-filament lamp of 1 to 1.2 intrinsic C.P. fitted in a parabolic mirror permitted Morse signals to be read in this country, at the rate of 17 a minute, over distances exceeding 11 miles. This was distinctly promising in connection with the use of half-watt lamps for beacons.

Mr. T. RITCHIE regretted the entire absence of standardisation in searchlight practice, even in the most elementary matters. If the barrel instead of the mirror of a searchlight were made, say, 24 in., the mirror would only be about 20 in. in diameter, and £20 to £30 would be saved (or lost) on the mirror alone. Diameter figures should refer to the mirror. It should be possible to draw up standard emission curves and standard specifications for the crater diameter as a fraction of the mirror diameter. By increasing from 1 to 5 KW. input, from 4 to 6¼ C.P. per watt, to the mirror, could be got in modern searchlights, and in the vapour-cooled type 10 to 12 C.P. per watt was obtainable, according to the rate of carbon consumption. Due to this and elimination of the red cone surrounding the crater, a whiter light and greater penetration was obtained: tests showed that gunners could find and hit a target 2 or 3 miles further away, using a projector of the vapour-cooled type, instead of an otherwise similar stan-

dard lamp. The small, heavily worked carbons in the vapour-cooled type could be impregnated without the ill effects noticed when using ordinary current densities. Combustion was better at the higher working temperature, and due to less scattering of the beam the observer could keep within hail of the operator without being dazzled.

Mr. J. W. WILLCOX gave test data showing the excellent performance of metal-filament lamps in small searchlights (9-12 in. diameter, 2¾-3 in. focus) required to deliver a relatively small volume of light for pick-up distances not more than 5,000 ft. The multiplication factor of the mirrow was 500 to 1,000 for 8° beams and 3,000 to 6,000 for 5° beams. Due to the sharper focus obtainable, incandescent lamps had been found better than arcs for locomotive headlights.

Mr. L. R. B. PEARCE suggested that impregnation with strontium salts might introduce unstable resistance conditions and cause "spurting."

A VISITOR stated that the French authorities made a practice of over-running incandescent filament lamps in a certain class of searchlight. By over-running 8 or 16-volt lamps 100 per cent., light could be obtained at ½ watt per C.P. The lamps lasted only one or two hours, which was quite sufficient for the purpose in view. Was it not possible that the use of several lamps concentrating on one spot would overcome the limitations of a single beam?

Mr. H. SMITH quoted some of the conclusions reached in recent military searchlight investigations in America. By altering the shape and composition of carbons, 50 per cent. increase in light could be obtained. Coring steadied the arc and gave the crater the right shape and brightness. Though yellow rays penetrated farthest, it was no use trying to make yellow light. It involved a flame arc which fouled the mirror, choked operators and spoiled focus: the loss was greater than the gain.

Prof. BLONDEL (communicated) stated that existing methods of specifying range were too vague and empirical. Atmospheric absorption varied greatly in different districts and complete over-land data were not available. He gave mathematical expressions and lists of numerical factors and relevant physical data, and made allowance for the sudden decrease in visual acuity occurring when illumination falls below 0.15 metre-candle.

Mr. J. S. Dow pointed out that there were sound physical reasons why blue rays should be excluded from searchlight beams. Not only had they poor penetrating power, but also their dispersion produced a blue-white haze very objectionable in practice. Better definition of distant objects could be obtained if blue rays were excluded.

Mr. CHALMERS said that Nerz's range formula neglected to account for the distance of the observer; this was not permissible if the object viewed subtended only one or two minutes of arc at the observer's eye. So long as glasses of moderate magnifying-power were employed, small objects could be seen at as great range as large objects viewed by the naked eye.

Mrs. HERTHA AYRTON said that previous speakers had almost ignored the question of arc stability, which was extremely important and depended on many factors. The supply generator used should give 15 or 20 volts excess pressure, on open circuit, above that required at the arc. Six years ago she had sent to the Admiralty drawings of the shapes to which carbons should be cut: this information had not been applied, but the recent American investigations again showed its importance. In investigating the best running conditions, the speaker had found 120 amps. at 70 volts on the arc, using a 38-mm. solid positive, had given a long and stable arc with 20 per cent. more light than usual. Best results depended largely on the operator's skill.

Mr. A. P TROTTER said that the practical operation of searchlights was very simple, whereas to express their theory mathematically was difficult and unsatisfactory. So many arbitrary constants were involved that there was little theory left by the time one had evolved an accurate formula. Residents in London had nightly opportunity of observing what splendid beams were obtained from modern searchlights. As a matter of fact they showed less divergence than was dictated by theory. Any attempt to express and work with the candle-power of a searchlight was unsatisfactory. The only satisfactory method was to deal with lumens and flux of light.

NEW PATENTS APPLIED FOR, 1915.

(NOT YET PUBLISHED).

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

427. "Gas fires and stoves heated by gas or mineral oil or electricity." P. F. WILLIAMS. January 11th.

431. "Manufacture of insulating material." SOC. ANON. DES COMBUSTIBLES INDUSTRIELS. January 11th. (Convention date, January 9th, 1914, France.) (Complete.)

433. "Adjustable stand or holder for crystals used as detectors of electric signals in wireless telegraphy and wireless telephony." C. H. PARKER. January 11th.

435. "Manufacture of metallic tungsten free from carbon." J. C. BUTTERFIELD. January 11th.

441. "Electric clock." F. O. READ & E. G. THOMPSON. January 11th.

450. "Process of and means for manufacturing electric carbons." COMPAGNIE DES CHARBONS FABIUS HENRION. January 11th. (Convention date, January 13th, 1914, Belgium.) (Complete.)

459. "Construction of brush holders for electric dynamos and motors." A. B. BACK. January 12th.

464. "Auto cable-laying attachment for the laying and reeling up of telegraph and telephone cables." G. KENNARD & E. A. PELLS. January 12th.

482. "Electric-lamp holders and electrical accessories." J. N. MOLLETT & E. MOLLETT. January 12th.

484. "Transformer and circuit arrangements therefor." G. J. VAN SWAAY & H. I. KEUS. January 12th. (Complete.) (Convention date, January 27th, 1914, Holland.)

491. "Electric motor control systems." BRITISH THOMSON-HOUSTON CO., LTD. January 12th. (General Electric Co., United States.)

498. "Selecting devices operated by current impulses." O. IMRAY. January 12th. (Siemens & Halske Akt. Ges., Germany.) (Complete.)

519. "Polyphase generator for high-frequency currents with polyphase-tuned spark-gap." L. ROUZET. January 12th. (Convention date, January 12th, 1914, France.) (Complete.)

528. "Alternating-current generators of the permanent-magnet type." R. MERCER. January 12th.

547. "Magnetos and dynamos." K. R. SMITH. January 13th.

553. "Electric locks and switches for lifts." SMITH, MAJOR & STEVENS, LTD., & C. G. MAJOR. January 13th.

558. "Adapter couplings, switch lamp-holders, and holders for other electric fittings." V. C. H. GIBSON. January 13th.

561. "Electric wall plugs and the like." C. PRESSLAND. January 13th.

562. "Electric lamp-holders." C. PRESSLAND. January 13th.

565. "Gyro-compasses." J. PERRY & S. G. BROWN. January 13th.

569. "Electrical steering and like gear." HARLAND & WOLFF, LTD., & H. H. BENTLEY. January 13th.

580. "Manual and semi-automatic telephone systems." BETULANDER AUTOMATIC TELEPHONE CO., LTD., & W. AITKEN. January 14th.

596. "Automatic electro-dynamic brake system for feed-reels and the like." H V. JAMES. January 14th.

611. "Electrical vibrators or buzzers." A. H. NICHOLSON. January 14th. (Complete.)

641. "Magneto ignition apparatus." M. S. CONNER. January 15th.

647. "Electric signalling." F. G. COLE. January 15th.

651. "Electric condensers." G. A. LISTER, E. A. WATSON, & MORRIS & LISTER, LTD. January 15th.

676. "Electric arc lamps for kinematographic projections." A. ZANOTTA. January 15th. (Complete.)

677. "Electric cable sockets." C. PRESSLAND. January 15th.

712. "Electric switches." E. G. HARCOURT. January 16th.

717. "Protection of electric cables." J. H. BOWDEN & H. F. J. THOMPSON. January 16th.

718. "Automatic electric safety catches or locks." A. A. SMETHURST & G W. SIZER. January 16th.

722. "Safety-devices or vacuum relays for electric circuits." SIEMENS-SCHUCKERTWERKE G.M.B.H. January 16th. (Addition to 17,532/13. Convention date, January 16th, 1914, Germany.) (Complete.)

723. "Stray-wave protection devices for electric circuits." SIEMENS-SCHUCKERTWERKE G.M.B.H. January 16th. (Addition to 17,532/13. Convention date, January 17th, 1914, Germany.) (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford, price, post free, 9d. (in stamps).

1913.

21,361. APPARATUS FOR OPERATING RAILWAY SIGNALS AND THE LIKE. R. J. Dennett & A. P. Houghton. September 22nd.

29,615. AUTOMATIC OR SEMI-AUTOMATIC TELEPHONE EXCHANGE SYSTEMS. G. A. Betulander. December 23rd. (December 24th, 1912.)

29,712. TRANSMISSION OF WIRELESS SIGNALS. R. C. Galletti & Galletti's Wireless Telegraph & Telephone Co. December 24th. (Cognate application, 2,738/14.)

29,752. ELECTRIC MOTOR CONTROL SYSTEMS FOR TRAINS AND THE LIKE. British Thomson-Houston Co. (General Electric Co.). December 24th.

30,083. ELECTRIC MOTOR CONTROL. British Thomson-Houston Co., & H. C. Hastings. December 31st.

1914.

53. SEMI-AUTOMATIC TELEPHONE EXCHANGE SYSTEMS. W. Aitken & R. Aitken January 1st.

173. IGNITION SYSTEMS FOR INTERNAL-COMBUSTION ENGINES. C. T. Mason. January 3rd.

391. SWITCHING SYSTEMS FOR INSERTING AND CUTTING-OUT RESISTANCES AND THE LIKE. British Thomson-Houston Co. & H. C. Hastings. January 6th.

3,011. ELECTRIC SWITCHES. H. Lucas & W. H. Edwards. February 5th.

3,360. IMPULSE CONTROL SYSTEMS FOR AUTOMATIC TELEPHONE EXCHANGES. Western Electric Co. (F. T. Woodward, acting for Western Electric Co.). February 9th.

5,050. ELECTRIC ARC LAMPS. F. W. Sturgess. February 26th.

9,116. MARKING DEVICES FOR RECORDING INSTRUMENTS. Evershed & Vignoles, Ltd., & G. W. Binsted. April 9th.

9,468. ATTACHMENT OF ELECTRICAL CONDUCTORS TO DYNAMO BRUSHES AND THE LIKE. Soc. Anon. le Carbone & E. Gindre. April 16th.

10,948. ELECTRIC RAILWAYS. C. M. White (M. E. Sturges). May 4th.

11,624. ELECTRIC IGNITERS. F. Celeri. May 11th.

13,707. DEVICES FOR PUTTING UP AND TAKING DOWN ELECTRIC LAMPS. A. H. Burbidge & R. E. Alderman. June 5th.

14,265. PORTABLE FACING TOOL FOR ELECTRICAL CONTACTS AND THE LIKE. A. J. Croft. June 13th.

18,076. SELECTING DEVICES FOR AUTOMATIC OR SEMI-AUTOMATIC TELEPHONE SYSTEMS. G. A. Betulander. July 30th. (August 1st, 1913.)

19,517. MAGNETIZING PERMANENT MAGNETS. P. Lynch, H. Wochner & F. W. Sauermann. September 7th.

21,583. MAGNETO-ELECTRIC MACHINES PARTICULARLY FOR IGNITION PURPOSES. C. T. Mason. October 27th. (Divided application on 29,655/13. December 23rd.)

21,610. MAGNETO-ELECTRIC MACHINES PARTICULARLY FOR IGNITION PURPOSES. C. T. Mason. October 27th. Divided application on 29,655/13. December 23rd.)

21,743. MAGNETO-ELECTRIC MACHINES PARTICULARLY FOR IGNITION PURPOSES. October 29th. C. T. MASON. (Divided application on 29,655/13. December 23rd.)

21,823. IGNITION SYSTEMS FOR INTERNAL-COMBUSTION ENGINES. C. T. Mason. January 3rd. (Divided application on 173/14. January 3rd.)

21,966. MAGNETO-ELECTRIC GENERATORS FOR IGNITION PURPOSES. C. T. Mason. November 3rd. (Divided application on 29,655/13. December 23rd.)